SOUTHERN POWER AND INDUSTRY

Ad Index, page 118

SEPTEMBER, 1950

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The SAFETY-CIRCLE

The Allis-Chalmers *SAFETY-CIRCLE* is the frame and ends of heavy cast iron that completely surround and protect the working parts of the *SAFETY-CIRCLE* motor.

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For complete details on *SAFETY-CIRCLE* advantages, see your A-C Authorized Dealer or Sales Office or write for Bulletin 51B6210B. Stocked in sizes 1 to 20 hp. *SAFETY-CIRCLE*, *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks.

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Volume 68 Number 9

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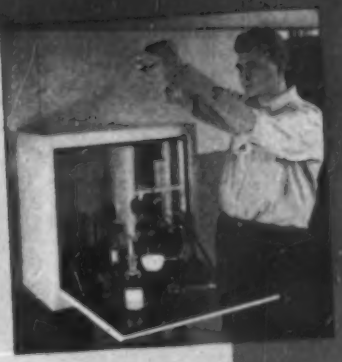

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Spectrographic analysis of boiler water sample in the Nalco Laboratories.

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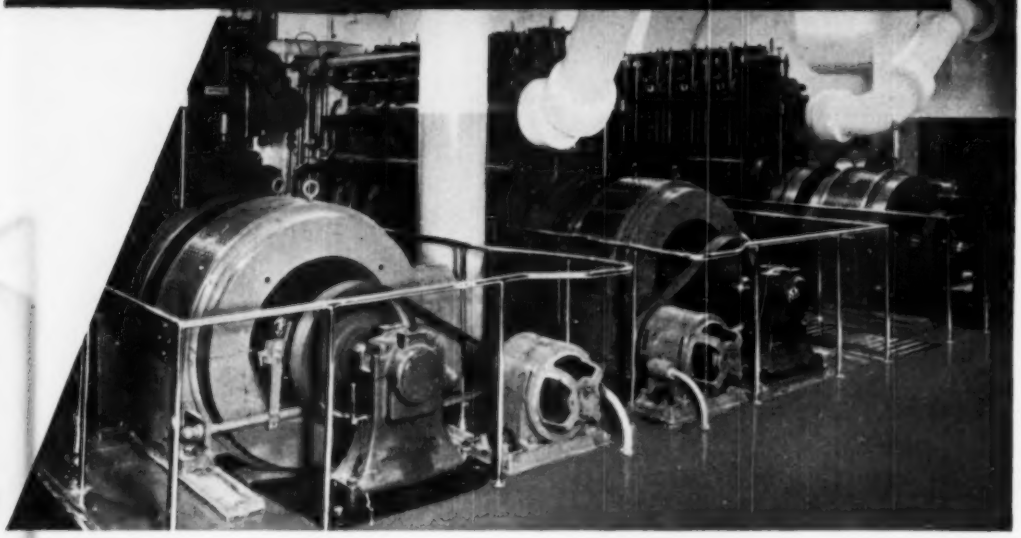

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STREAMLINED BAFFLES

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Enco's improved baffle design insures a uniform, high velocity gas flow over every square foot of heating surface.

2 Low draft loss

Smoothly curved baffles maintain a cross-flow of gases across the tube banks. Dead gas areas, bottlenecks and eddy currents are eliminated.

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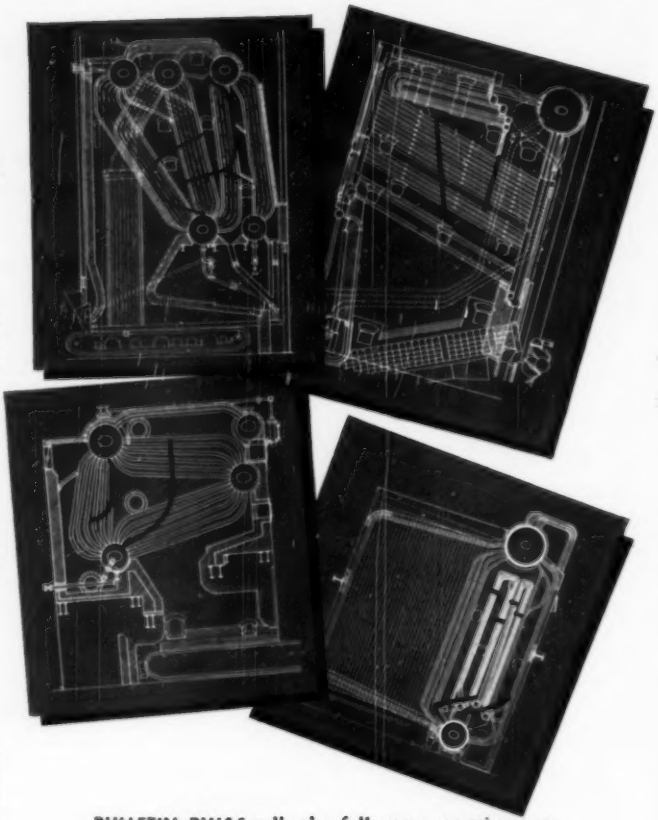

BULLETIN BW44 tells the full story, contains complete engineering data, explains how Enco Baffles provide maximum steam output with minimum fuel consumption. WRITE FOR YOUR FREE COPY TODAY!

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Facts and Trends

FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

September, 1950

THE SOUTHWEST, with its low cost fuel, is literally COOLING WITH HEAT with numerous high temperature ABSORPTION REFRIGERATION MACHINES. Typical installation is the 200-ton unit in the United Gas Corporation building in Houston, Texas. Operating on 12-14 psig steam, machine uses water and salt as a refrigerant-absorbent combination.

The absorption refrigeration machine replaced five 27-ton units which previously furnished summer air conditioning for a portion of the building. While producing 200 tons of cooling effect, the new single unit occupies but one-half the area required by the five small units that gave only 135 tons in cooling equivalent.

Absorption refrigeration systems, ranging in size from 115 to 350 tons, are especially attractive to localities with low-cost fuel, where low-pressure steam is available, in buildings where heating boilers remain idle during the cooling seasons, or where there is a lack of space for installing a conventional compression machine.

PLANT INSTRUMENTATION IS COMPLEX. In the field of temperature measurement alone, the plant engineer must make his selection from "blind" or non-indicating controllers, pressure-type thermometers, or electrical temperature measuring systems. The latter classification is further subdivided into five types of pyrometers.

To assist the engineer in working out his process control problems, SP&I is starting in this issue a series of instrumentation articles dealing with variables commonly encountered in the plant and the means available for measurement and control. Advantages and limitations of different systems will be discussed, as well as various installation and maintenance factors which should be considered.

UTILIZATION OF HEAT PUMPS in the Florida Citrus Canners Cooperative at Lake Wales is believed to be the first large industrial application. Equipment and methods for concentrating fruit juices were described in detail in the August issue of SP&I. The process, receiving wide publicity, is unique in that a refrigerating machine instead of a boiler is used to heat the citrus juice and drive off the excess water. The same refrigerating machine simultaneously cools and condenses the water vapor, under a strong vacuum. Heat balance in this closed cycle is very good, only 70 gallons of water being needed per minute to carry away extra heat, through a small supplementary condenser.

SOCKET WRENCH DELUXE is the 67 lb unit recently manufactured by the Plomb Tool Company for use with impact equipment by the road maintenance crew of a large water and power utility. It has an outside diameter of 9¼-in., a length of 8-in., and a drive size of 1 1/2-in. By contrast, the smallest socket wrench of the manufacturer has an opening of 3/16-in. and weighs only 1/50th of a pound.

STEAM CIRCULATION SYSTEM, incorporating a float trap and circulator or injector, improves the efficiency of STEAM HEATING PROCESS EQUIPMENT, such as the heaters for drying machines for textiles or the tubular heaters of stills and evaporators. Flow of steam and condensate in the steam spaces of these types of equipment is naturally sluggish, thereby causing a reduction in the rate of heat transfer. In the new Sarco circulation system, the circulator or injector uses the uncondensed steam to induce turbulence in the flow of condensate, thus improving the heat transfer and speeding up production with a saving of steam.

THE FLORIDA CITRUS INDUSTRY uses enormous refrigerated warehouses for storing their processed product subject to shipping orders. Light must be available in all parts of these warehouses but the heat must be held to a minimum to avoid excessive refrigeration. Power must also be available for stackers, wrappers, etc. Since handling takes place only in one part of a warehouse at any one time, MOBILE ELECTRIC OUTLETS are advantageous.

The Adams Packing Association at Auburndale, Florida has solved the problem with a Feedrail installation, a system of lighting and power distribution through mobile trolleys. Operational details of the lighting trolleys and similar installation for 250 v power to electric motors driving stackers and wrappers will be described in the October BETTER PRODUCTION issue of SP&I.

TELEMETERING AND REMOTE CONTROL EQUIPMENT of the Memphis Light, Gas & Water Division, for coordinated gas pressure control, have proven highly satisfactory. At the present time the system has approximately 469 pair-miles of telephone cable, extending from various control points and transmitting to a central dispatcher's board. Control system includes both BRISTOL and FOXBORO equipment, depending upon the gas pressure involved.

Both instruments provide means whereby the dispatcher can raise or lower the pressure being maintained by individual regulators throughout the system. His panel board instruments show pressures at each check point, so that need for and results of each remotely actuated change in controlled pressure may be observed. Design, installational, and operating data will be featured in the November issue of SP&I.

REPAIR OF MECHANICAL EQUIPMENT IN CORROSIVE SERVICE can often be handled by synthetic resin cements, resistant to most acids, alkalis, and solvents up to temperatures of 325 F. The only common acids which cannot be handled by these repair cements are sulphuric acid above 90 per cent concentration, and nitric and chromic acids. When set, the repair cements are hard, resistant to abrasion and can be machined if necessary. APPLICATIONS: repair of glass and rubber lined equipment, condenser tubes, corroded and broken pipe, valves, and porcelain pipe fittings and equipment.

NEW ABRASION RESISTANT HARD COATING FOR ALUMINUM, called MHC (Martin Hard Coating) is claimed by The Glenn L. Martin Company of Baltimore to be far superior to conventional anodized surfaces. It is an electro-chemical coating applied to aluminum and aluminum alloys containing less than 5 per cent copper either in the wrought or cast form. Martin reports that while the hard coating process is relatively expensive, as currently applied on an experimental basis, on a production scale it would probably compare in cost with such operations as the heat-treating of steel or be considerably cheaper than that of hard chrome plating.

THE PORT NECHES, TEXAS SYNTHETIC RUBBER PLANT, with a rated capacity of 60,000 tons, is being reactivated by the United States Rubber Company. The company will continue to operate the Borger plant until Port Neches is fully reactivated, after which Borger will be turned over to the Phillips Chemical Company.

NEW TECHNICAL METHODS FOR PROCESSING LIME, carried in the July issue of THE JOURNAL OF SOUTHERN RESEARCH, a publication of the Southern Association of Science and Industry in Atlanta, show how the South can develop a multi-million dollar expansion of its lime production industry. Lime is used in municipal water treatment, paper processing and other chemical processes.

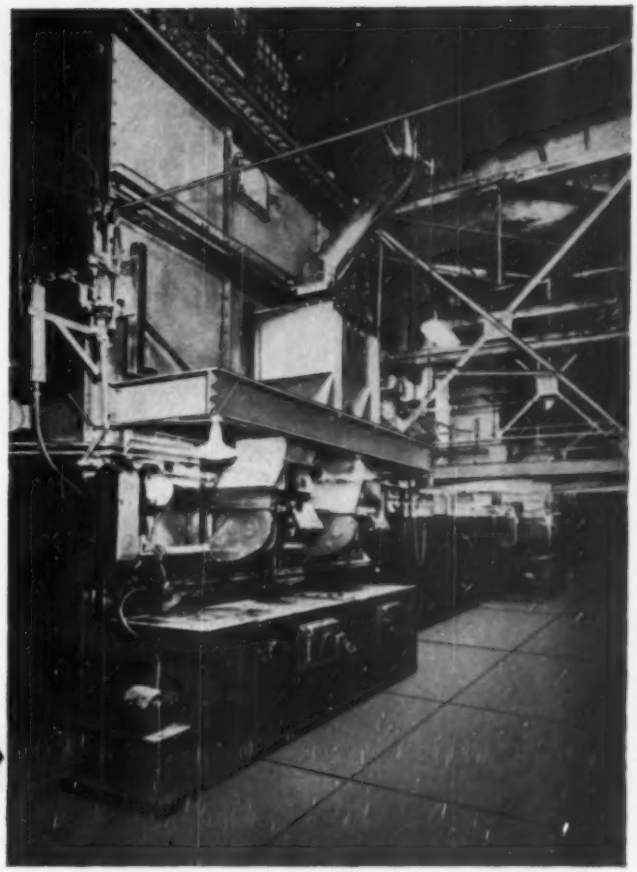
The Southern states, particularly Florida, have large deposits of limerock. North and South Carolina, Mississippi, Georgia and Louisiana import some lime from Tennessee and Alabama. However, considerable quantities come from outside the South, and Southern consumers are penalized by freight charges. Report published by SASI was prepared by Dr. Mack Tyner, of the Florida Engineering and Industrial Experiment Station, at the University of Florida.

Write the editors for additional information on any of the above items.

SOUTHERN POWER & INDUSTRY 806 Peachtree St., N.E. Atlanta 5, Ga.

It's even coal distribution that gives peak combustion efficiency

AND AMERICAN PERFECT SPREAD STOKERS GIVE YOU BOTH



Two AE Perfect Spread Stokers recently installed by Marion Power Shovel Company. The boilers, each of 38,000 lbs. per capacity, are Wickes two-drum bent-tube type. Consulting Engineer, Frederick L. Smith. Send coupon for the complete story of this power plant.

SERVICE RECORDS prove that spreader stokers save money wherever installed. They burn almost any coal with remarkable efficiency, including the high moisture, high ash types.

And the AE Perfect Spread Stoker is the best investment you can make in a spreader. Its feeder assures continuous, accurate coal feed, even when coal is wet. Its spiral overthrow rotor *is unique and absolutely superior in distributing coal evenly over the entire grate.* Then, too, the AE engineered cinder reinjection and adjustable overfire air system play important parts in assuring maximum combustion efficiency.

Perfect Spread Stokers come with either continuous discharge, dumping or stationary grates. Capacities range from 8,000 to 500,000 lbs. of steam per hour. Mail coupon for Perfect Spread booklet and the Marion Power Shovel story.

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AMERICAN ENGINEERING COMPANY

PHILADELPHIA 25, PENNA.

AE Products are: Taylor and Perfect Spread Stokers, Marine Deck Auxiliaries, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Car Shakers, Car Pullers

American Engineering Company
2421 Aramingo Ave., Philadelphia 25, Pa.

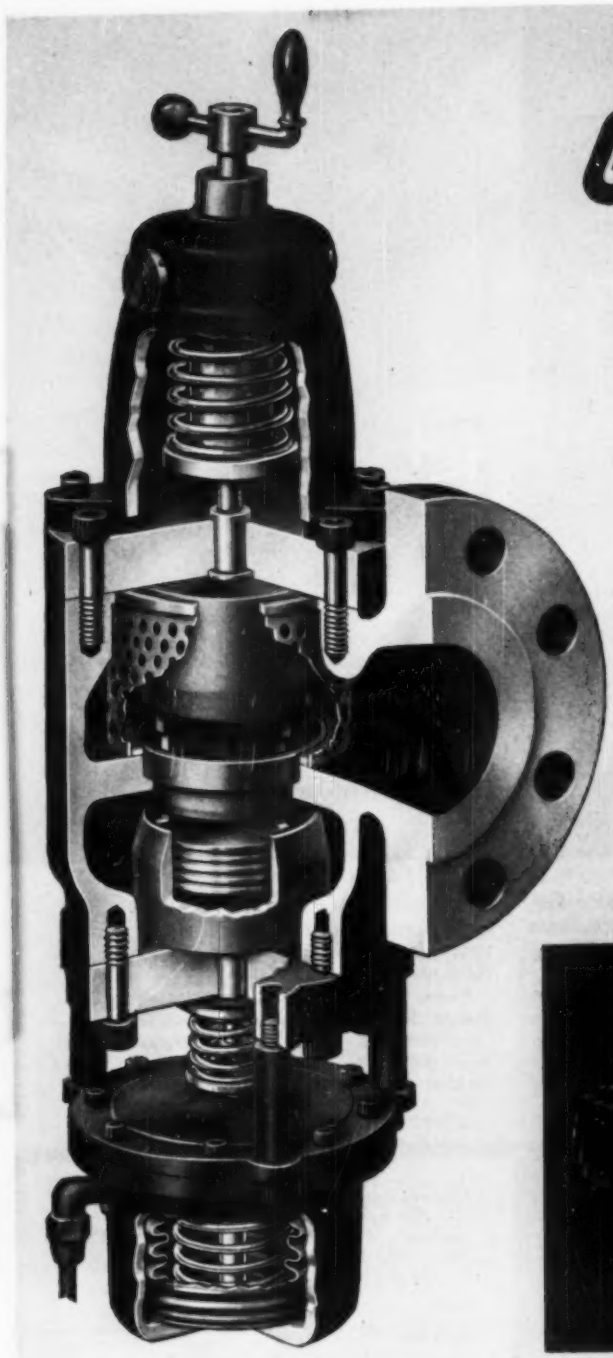
Gentlemen: We are certainly interested in saving fuel dollars. Send booklet on Perfect Spread Stokers and the story on Marion Power Shovel power plant.

Name ..... Title .....

Company .....

Address .....

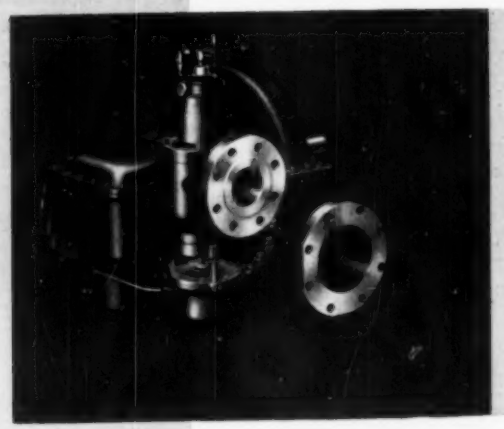
City ..... Zone ..... State .....



GET THE

GE

TYPE DP



BEST IN VALVING

WITH STANDARD TURBINE DRIVES

On General Electric's standard Type DP mechanical-drive turbine, the trip-throttle valve and the governing valve are combined into one casing. This exclusive G-E feature provides a compact and neat design which simplifies piping by usually eliminating the need for a separate valve in the steam line. You get easier operation, too, because pressures across the valves are equalized. The throttle valve mechanism is ball-bearing mounted, and only hard packings are used.

POSITIVE OVERSPEED PROTECTION

A bolt-type emergency governor, mounted in the turbine shaft, actuates a trip mechanism when speed rises 15% above normal. This action trips the throttle valve closed, positively shuts off steam flow to the turbine. A convenient hand lever is also provided for tripping the valve.

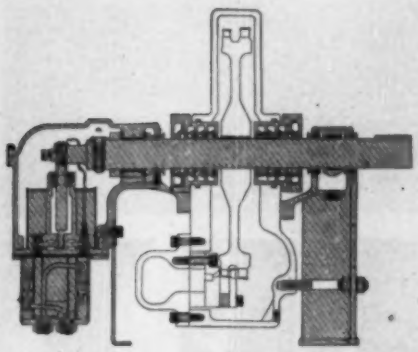
BETTER GOVERNING AND REGULATION

Working with the DP's powerful hydraulic governor, the governing valve gives you greater performance accuracy. The balanced reaction design reduces valve unbalance to a minimum. Relief holes equalize pressure between the valve and the guide piston of the seat. Hard packing decreases the force required to move the valve, results in smoother operation.

LONG LIFE AND DEPENDABILITY

The stainless steel stem and nitrided stainless steel valve and seat are designed to last for years. Maintenance is cut through the use of corrosion-resistant labyrinth stem sealing bushings. No soft packings are used. An easily removable monel steam strainer in the throttle valve chest halts foreign material before it can reach valve or steam parts.

Look into *all* the features of the standard DP turbine. You'll find many extras, such as the valving, which can give you the performance and savings you want from a mechanical-drive turbine. Contact your nearest G-E sales office, or write for bulletin GEA-4955. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*



HOW STANDARDIZATION WORKS FOR YOU

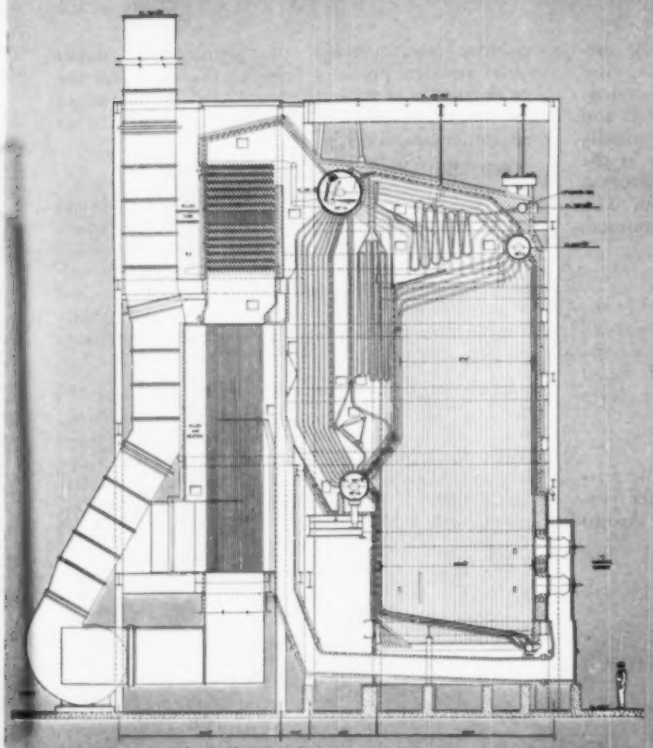
In the diagram at the left, all shaded parts are interchangeable on all sizes of DP turbines. Thus, it is easy to stock spares, and maintenance costs are reduced. All models have standard shaft height and coupling fits for easy installation or re-location in your plant. Standardization cuts manufacturing expense and the savings are passed on to you in the form of extra features, usually found only on "special" turbines.

GENERAL ELECTRIC

4,540,000 lbs. of steam per hour

Eight different orders for Riley Units from Houston Lighting and Power Company . . . . .

To assure adequate electric power for the industries and people of Houston and South Texas, Houston Lighting and Power Company has had to tremendously expand their generating facilities. Riley was selected to furnish all of the steam generating units in this expansion program involving nine units with a total steam generating capacity of 4,540,000 pounds of steam per hour.



HOUSTON LIGHTING & POWER CO., West Junction Station
825,000 lbs./hr. Riley Steam Generating Unit
1050 lbs. Pressure—905°F. Steam Temperature
Ebasco Services, Inc., *Engineers*

RILEY at Houston

January 1938
GABLE STREET STATION
1—250,000 lbs./hr. 975 lbs. 910°F.

March 1940
GABLE STREET STATION
1—140,000 lbs./hr. 225 lbs. 500°F.

May 1941
WEST JUNCTION STATION
1—400,000 lbs./hr. 1000 lbs. 905°F.

June 1945
WEST JUNCTION STATION
1—400,000 lbs./hr. 1000 lbs. 905°F.

January 1947
GREENS BAYOU STATION
2—675,000 lbs./hr. 1050 lbs. 905°F.

June 1947
WEST JUNCTION STATION
1—825,000 lbs./hr. 1050 lbs. 905°F.

April 1948
GABLE STREET STATION
1—350,000 lbs./hr. 1000 lbs. 900°F.

October 1948
WEST JUNCTION STATION
1—825,000 lbs./hr. 1050 lbs. 905°F.

TRADE MARK Rx REGISTERED

RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston · New York · Philadelphia · Washington · Buffalo · Pittsburgh · Cleveland · Detroit · Chicago
Cincinnati · Atlanta · New Orleans · Memphis · St. Louis · Kansas City · St. Paul · Tulsa · Houston
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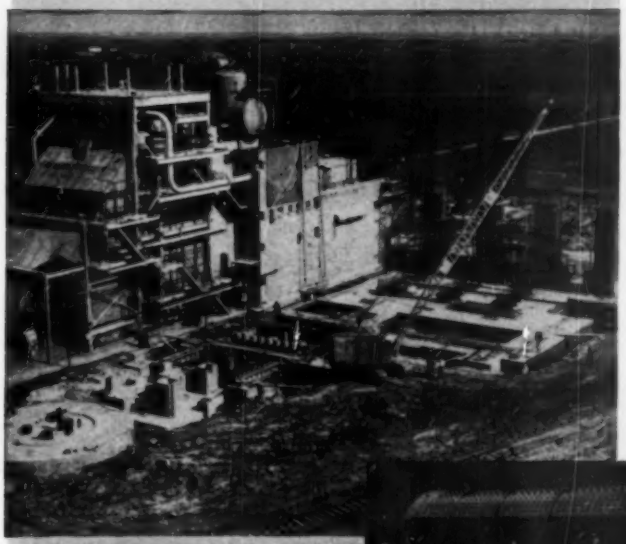
BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • FLUE GAS SCRUBBERS

from the 9 RILEY units at Houston

COMPARISON — Actual and predicted results
675,000 lbs./hr. Riley Unit—Greens Bayou Station

	Actual	Predicted
Temperature Feed Water	359.6	
Temperature Water to Boiler	452.2	452
Temperature Gas Leaving Airheater	314.3	370
Total Air Pressure	8.2	9.1
Total Draft Loss	6.9	7.7
Steam Temperature	905	905
Efficiency	84.97	82.1

Steam Output—643,200 lbs./hr.



View showing first 400,000 lbs./hr. Riley Unit at West Junction Station. Two 400,000 lbs./hr. and two 850,000 lbs./hr. Riley Units are now installed at this plant.

All of these public utilities have installed Riley Steam Generating Equipment:

PUBLIC SERVICE CO. OF INDIANA	
Dresser Station	1—300,000 lbs./hr.
Edwardsport Station	3—400,000 lbs./hr.
Noblesville Station	3—300,000 lbs./hr.
NORTHERN VIRGINIA POWER CO.	
Riverton Station	1—350,000 lbs./hr.
CENTRAL ILLINOIS LIGHT CO.	
R. S. Wallace Station	1—600,000 lbs./hr.
R. S. Wallace Station	1—375,000 lbs./hr.
R. S. Wallace Station	3—300,000 lbs./hr.
ARKANSAS POWER & LIGHT CO.	
Cecil Lynch Station	1—650,000 lbs./hr.
UTAH POWER & LIGHT CO.	
Orem Station	1—450,000 lbs./hr.
Jordan Station	1—620,000 lbs./hr.
WORCESTER COUNTY ELECTRIC CO.	
Webster Street Station	1—325,000 lbs./hr.
WEST PENN POWER CO.	
Milesburg Station	2—210,000 lbs./hr.
INTERSTATE POWER CO.	
Lansing Station	2—120,000 lbs./hr.
Fox Lake Station	2—120,000 lbs./hr.
Clinton Station	1— 45,000 lbs./hr.
NEW ORLEANS PUBLIC SERVICE CO.	
Market Street Station	1—330,000 lbs./hr.
IOWA-ILLINOIS GAS & ELECTRIC CO.	
Riverside Station	3—250,000 lbs./hr.
Coralville Station	1— 60,000 lbs./hr.
CITY OF LOS ANGELES	
Harbor Steam Station	3—825,000 lbs./hr.
Harbor Steam Station	2—675,000 lbs./hr.
MISSISSIPPI POWER CO.	
Plant Eaton	3—230,000 lbs./hr.
OTTER TAIL POWER CO.	
Kidder Station	2—100,000 lbs./hr.
Crookston Station	2— 75,000 lbs./hr.
Devils Lake Station	1— 75,000 lbs./hr.
Canby Station	1— 75,000 lbs./hr.
OHIO EDISON CO.	
Mad River Station	1—250,000 lbs./hr.
SOUTH CAROLINA POWER CO.	
Plant Hagood	2—230,000 lbs./hr.
GULF POWER CO.	
Pensacola Station	2—230,000 lbs./hr.
UNION ELECTRIC CO. OF MISSOURI	
Ashley Street Station	2—285,000 lbs./hr.
Ashley Street Station	3—310,000 lbs./hr.
CENTRAL OHIO LIGHT & POWER CO.	
Woodcock Station	1—120,000 lbs./hr.
Woodcock Station	1— 90,000 lbs./hr.
Woodcock Station	2— 60,000 lbs./hr.
PENNSYLVANIA ELECTRIC CO.	
Williamsburg Station	1—300,000 lbs./hr.
CAROLINA POWER & LIGHT CO.	
Moncure Station	2—330,000 lbs./hr.

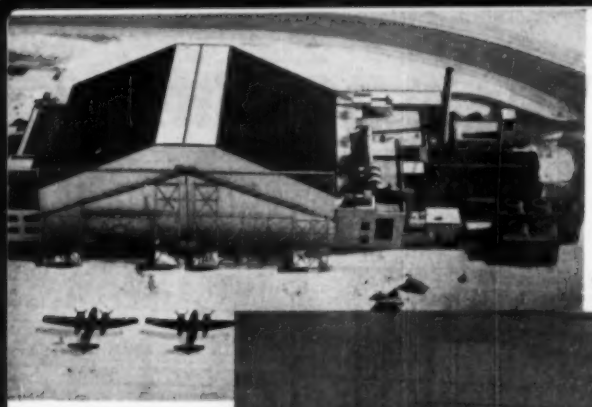
Steam Drum for Riley Unit at West Junction, 66 in. dia., 55 ft. long, 3 9/16 in. thick

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly l... costs

COMPLETE STEAM GENERATING UNITS

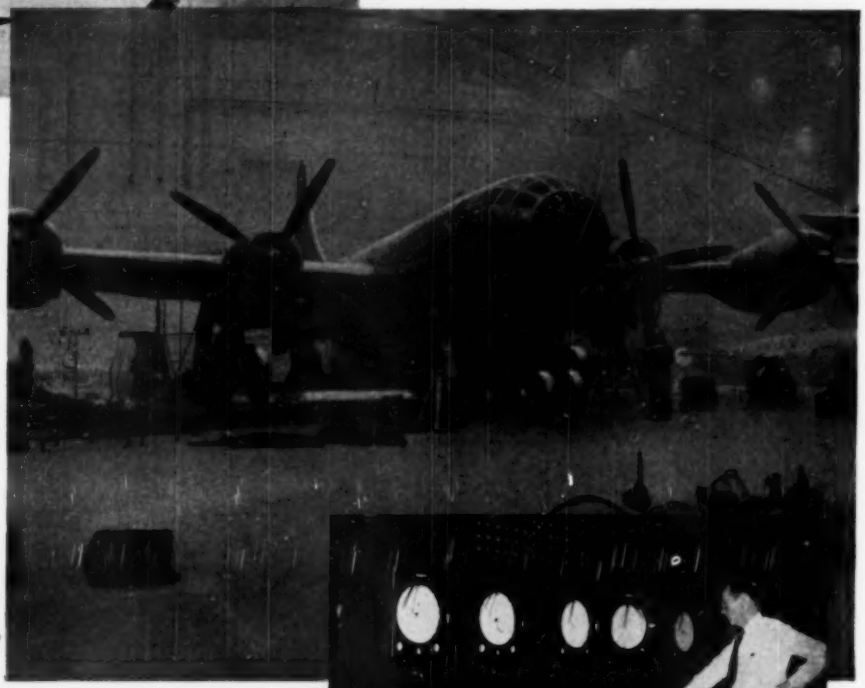
. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

ECONOMIZERS WATER-COOLED FURNACES • STEEL-CLAD ...SETTINGS • AIR HEATERS



Whether the COLD WAR Simmers or Sizzles

◀ WORLD'S LARGEST CLIMATIC TEST LABORATORY



▲ Above
CLIMATIC HANGAR
Air Proving Ground Headquarters
EGLIN AIR FORCE BASE FLORIDA

•

Architects and Engineers
ROBERT & COMPANY ASSOCIATES, Atlanta

•

General Contractors
J. A. JONES CONSTRUCTION CO.
Charlotte, N. C.

•

Air Conditioning by
YORK CORP.

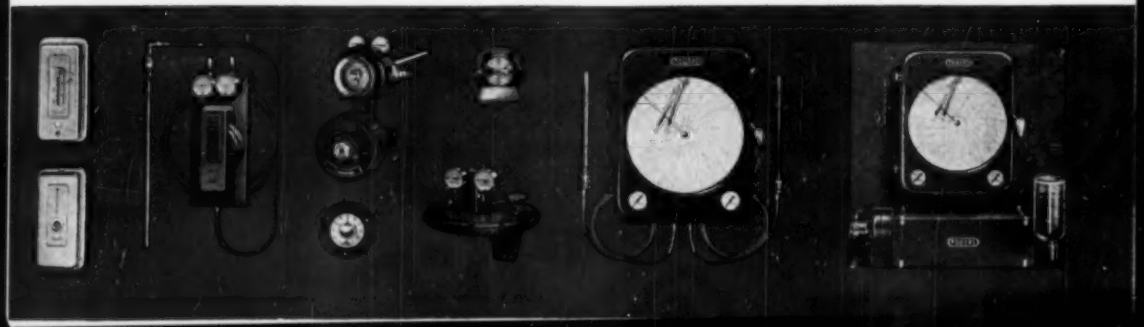
•

SIZE OF HANGAR
200' x 250' x 70' ▶

▲ **WEATHER CONTROL PANEL**—POWERS Series 100 Recording Regulating Instruments, and pneumatic switches for remotely controlling air conditions in Climatic Hangar shown above.

POWERS

Pneumatic Control Systems also used in—
ARMY SIGNAL CORPS CLIMATIC LABORATORY
Ft. Monmouth, New Jersey
N. A. C. A. Aircraft Engine Research Laboratory, Cleveland, Ohio
and many other prominent test laboratories



POWERS Control Helps EGLIN Climatic Hangar Keep Cool

at 165°F. down to 65°F. Below Zero

Air Force Equipment Is Tested In All Kinds of Weather

Here at Eglin Air Force Base, Florida, "cold war" is waged against defective combat and ground equipment. In the giant hangar B-36's and smaller planes, tanks, housing and vehicles are tested in man made arctic blizzards, tropical hurricanes, jungle dampness or dry desert heat. Jet engines, weapons, men, food, clothing and photographic equipment are tested in smaller rooms.

Air conditioning control problems encountered here, presented an interesting challenge for POWERS engineers. Many years of experience gained in meeting the unusual demands of other prominent military, industrial, public and commercial buildings were helpful in providing the automatic controls required for this "World's Largest Ice Box"

We welcome an opportunity of helping you find the right solution to your problems of air conditioning control. Whether they be simple, complex, large or small you can benefit from our many years of valuable experience. Phone or write your nearest POWERS office.

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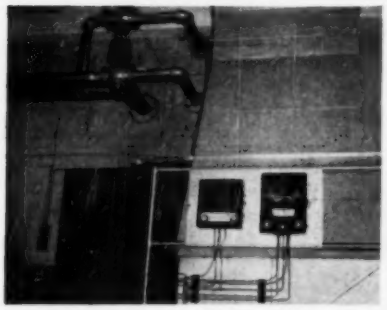

POWERS

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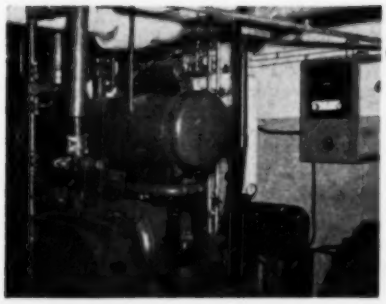

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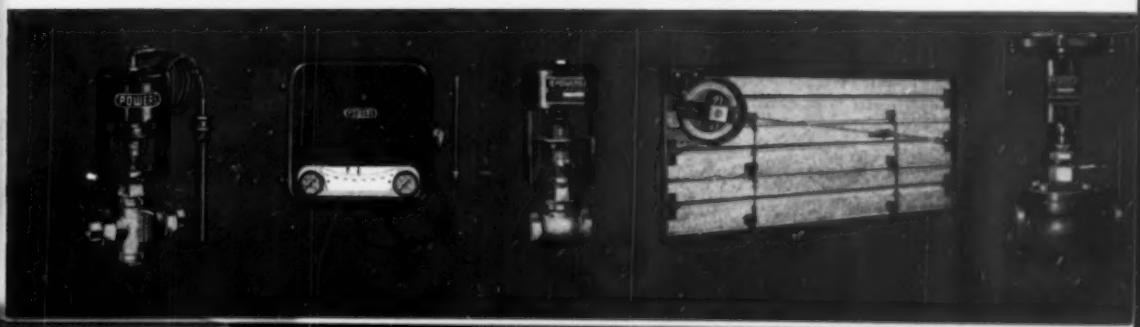

Power Moves Cheaper

by way of LINK-BELT SILENT CHAIN DRIVES

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Link-Belt Silverstreak Silent Chain Drives combine the ability to carry heavy overloads with the resilience that sustains and absorbs shock.

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Silverstreak Silent Chain Drives cost practically nothing for upkeep—run 10, 20 or more years without attention beyond occasional oiling.

COMPACT

Operating efficiently on short centers, they save valuable space. Ratios as high as 10 to 1 are commonly used.

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98.2% efficiency maintained throughout the life of the drive.

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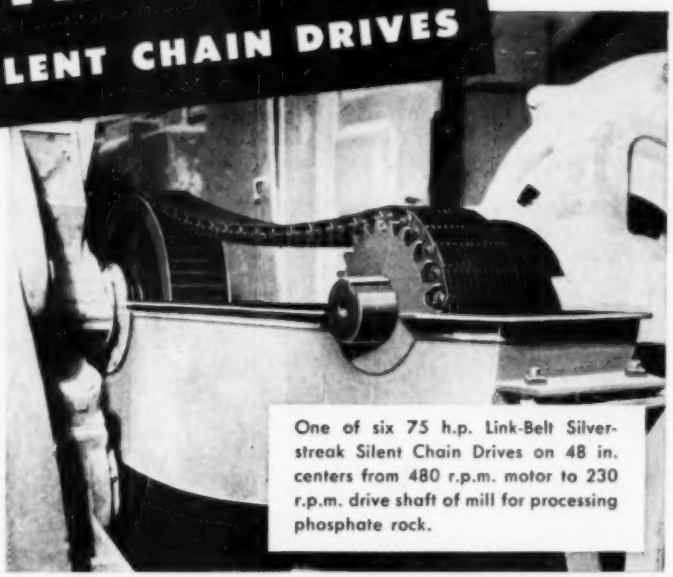
As the chain, in the form of a flexible rack, meshes with the teeth of the sprocket, the drive cannot slip.

½ to 50 h.p. Drives Right From Stock



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650	661	666	680	699	717	724	725	763	788	818	845	846	858	870	1010	1035
1040	1043	1044	1045	1047	1049	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
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Please send me without obligation, free booklets described in the September 1950 issue of SOUTHERN POWER AND INDUSTRY as circled below:

4	10	11	19	44	47	80	81	84	87	114	120	122	124	133	184	213
228	231	260	276	276	279	298	313	381	387	391	402	407	411	430	432	434
446	447	489	465	478	484	489	504	506	527	538	539	542	551	598	635	644
680	681	648	688	699	717	724	739	763	788	818	845	846	858	870	1010	1035
1040	1043	1044	1045	1047	1049	810	811	812	813	814	815	816	817	818	819	820
821	822	823	824	825	826	827	828	829	830	831	832	833				

Also send further information on following New Equipment (see pages 102-110)

K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13	K14	K15
K16	K17	K18	K19	K20	K21	K22	K23	K24	K25					

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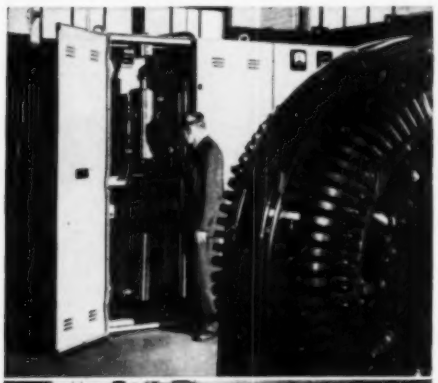
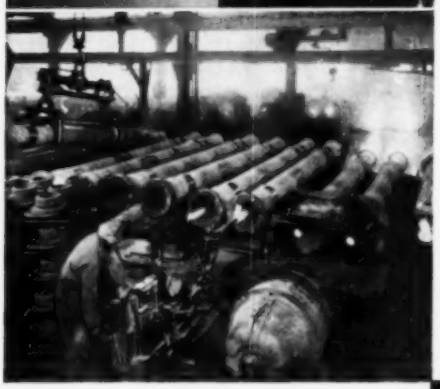
Equipment and Review Editor
SOUTHERN POWER & INDUSTRY
806 Peachtree St., N. E.
Atlanta 5, Ga.

$30,000 back in 5 years

The 500-kw, 250-volt G-E rectifier at the Florence Pipe Foundry and Machine Company requires only periodic inspection.





The G-E rectifier provides the d-c power which operates the cranes, ladles, and centrifugal casting machinery in the Florence Company's plant.

Florence Pipe Foundry & Machine Company

GETS LOW-COST D-C POWER WITH G-E RECTIFIERS

When the Florence Pipe Foundry & Machine Company needed additional d-c power in 1946, George E. Pfeffer, electrical engineer, looked for the best way to do the job. He learned that installing G-E rectifiers would save in three ways:

1. Installation costs—$10,000 less

The rectifiers were compact enough to fit into the present power house. Other types of generating equipment required the construction of a costly new building.

2. Operating costs—no new personnel needed

Because rectifiers need only periodic inspection, there's no need for standby personnel.

3. Power costs—$600 a year less

The extra high efficiency of G-E sealed rectifiers saves about $600 a year in power bills.

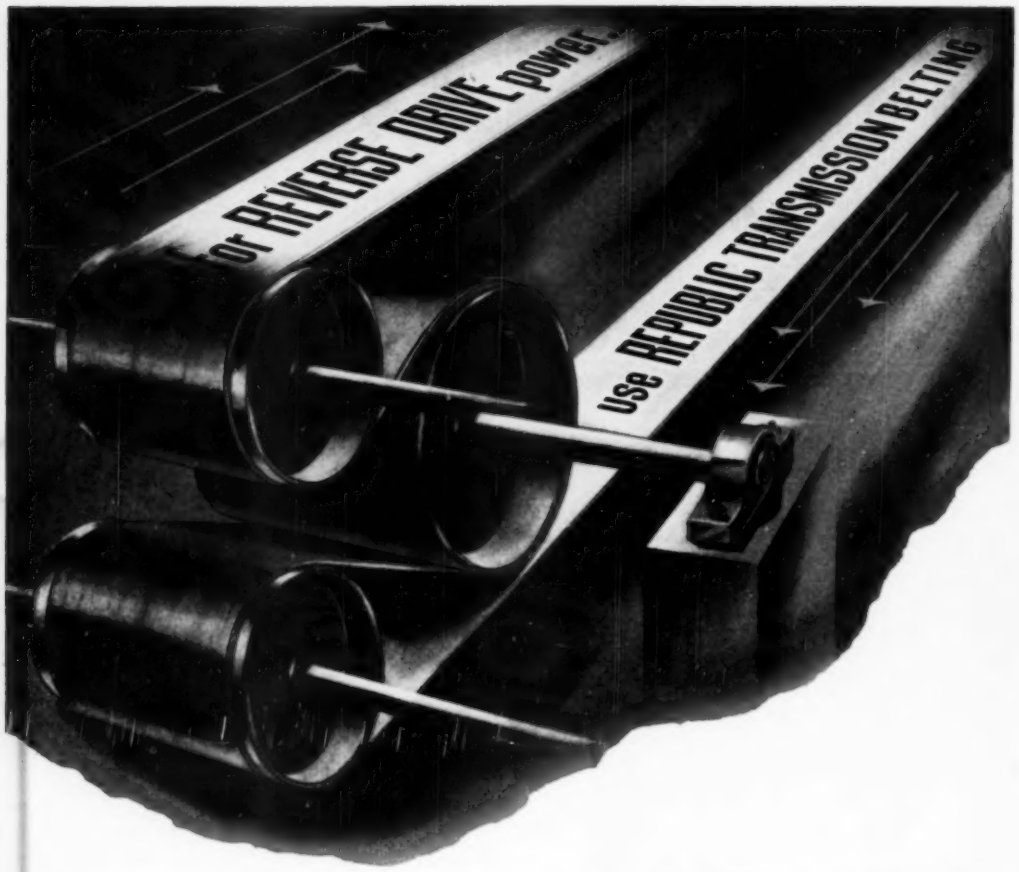
The combined savings will amount to $30,000 in five years. That will pay for the rectifiers, and for the cost of installing them.

To Cut your Power Costs

Find out today how you can put G-E power rectifiers to work in your plant. Call or write your nearest G-E sales office for information. **Apparatus Department, General Electric Company, Schenectady, N. Y.**

G-E MERCURY-ARC RECTIFIERS MEAN LOW-COST D-C POWER

GENERAL ELECTRIC



Directional reverses come with machine gun speed for the transmission belt shown above. It's Republic's Challenger Belting on a reverse power drive installation at Stantonsburg Lumber Company, Stantonsburg, North Carolina.

Constant reverse flexing like this is tough on any belt, yet Republic's Challenger, now in its third straight year of continuous service, shows no signs of tiring.

Of course, Republic Challenger Transmission Belting is designed for heavy industrial drives where shocks and stresses are encountered, and is also perfectly suited to high-speed drives operating over small pulleys.

Challenger is a *pre-stretched* belt that doesn't loosen when pulling extra heavy loads. It's a belt that's free from fastener trouble because it is built with hard-woven duck. All edges are sealed against moisture.

Ask your local Republic Distributor about Challenger Belting today or write direct for information. Standard widths and plies are available in both roll or endless lengths. Both top and bottom surfaces have non-slip friction for better pulley traction.

See Your Local Republic Distributor

Close contact with experts like the Taylor Parker Company, Republic's Distributor in Norfolk, Virginia, who installed this Challenger Transmission Belt, assures success in industrial rubber applications. Contact your local Republic Distributor now about all your problems in . . . . HOSE, BELTING, PACKING and EXTRUDED and MOLDED RUBBER PRODUCTS.

INDUSTRIAL RUBBER PRODUCTS BY

REPUBLIC RUBBER DIVISION

Lee Rubber & Tire Corporation

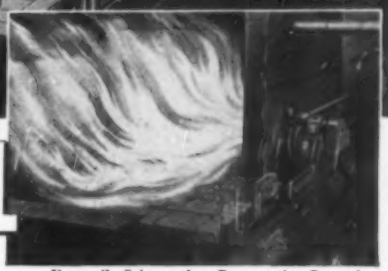
YOUNGSTOWN, OHIO

IRON FIREMAN Pneumatic Spreader STOKER

The Iron Fireman Pneumatic Spreader stoker distributes pre-heated coal evenly over entire grate area. Fines burn in suspension; larger pieces form shallow fuel bed. Exceptionally responsive to load changes.

with quick change to OIL or GAS

Protect your boiler plant against high fuel prices or shortages



For oil firing, the Pneumatic Spreader stoker nozzle is removed and the Iron Fireman rotary oil burner is swung into firing position. Burns No. 6 oil or lighter.

The Iron Fireman ring type gas burner surrounds the same firing port used for both coal and oil. Fires natural or mixed gas with either forced or natural draft.

With Iron Fireman firing you can switch readily from one fuel to another. The Iron Fireman gas-oil-coal combination fires all three fuels from the same port in the boiler front. Fuel change is accomplished in a short time without major alterations. For short emergency firing periods fuels can be switched in a few minutes.

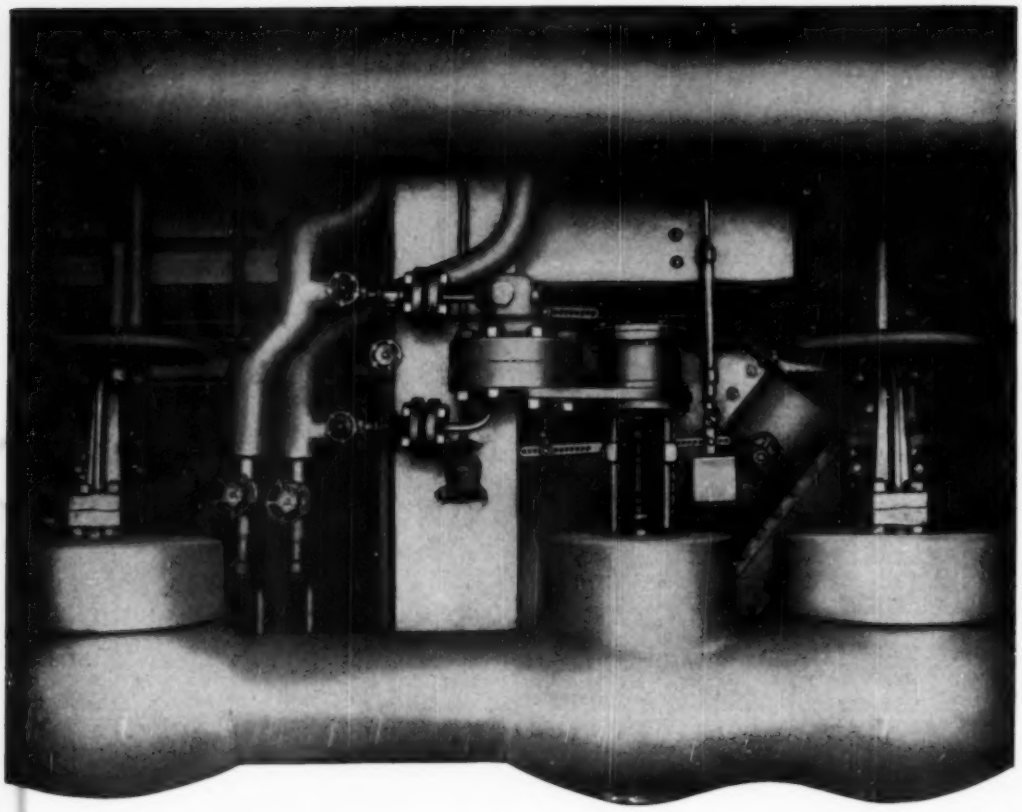
Advantages are obvious. Your plant can benefit from seasonal price changes in the different fuels. You have standby equipment to meet almost any conceivable fuel emergency. You do not sacrifice efficiency in changing fuels, for all three burners are engineered for the job, with Iron Fireman quality and dependability through and through.

For further information write to Iron Fireman Mfg. Co., 3248 W. 106th St., Cleveland 11, Ohio. Other plants in Portland, Oregon; Toronto, Canada. Authorized Iron Fireman dealers throughout the U. S. and Canada.

IRON FIREMAN

Builders of Automatic Heating Equipment for More than 27 Years

AUTOMATIC FIRING EQUIPMENT FOR COAL, GAS, OIL



How to hold boiler water level closely

When you want to hold boiler water level within close limits, no matter how widely or rapidly loads change, depend on COPES Flowmatic—the simplest, most widely used flow-level type of feed control.

This industrial installation, for example, is on a 660-psi Riley Steam Generator rated at 225,000 pounds per hour. Loads constantly fluctuate 10,000 pounds per hour over a total range from 150,000 to 265,000 pounds per hour. Yet water level is held within plus-or-minus one inch at all times.

More than 1200 Flowmatic users like the coordination of influences from steam flow and water level to get the exact feed needed for close level control. They also like the ease with which plant personnel can handle all maintenance.

For a complete performance report on installation illustrated above, write for Bulletin 485.

NORTHERN EQUIPMENT CO.
903 Grove Drive, Erie, Pa.
BRANCH PLANTS: Canada, England, France, Austria, Italy. *Representatives Everywhere*

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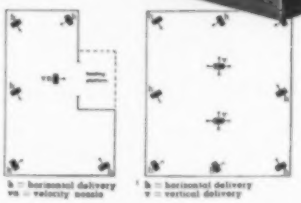
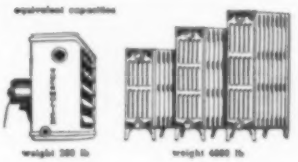
Boiler Feed Water Control . . . Excess or Constant Pressure Control, Steam or Water . . . Liquid Level Control . . . Balanced Valves . . . Desuperheaters . . . Boiler Steam Temperature Control . . . Hi-Low Water Alarms.

Consider the advantages of UNIT HEATING

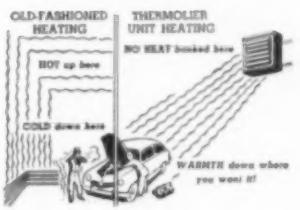
Heating comfort Unit heaters provide quick heating from a cold start. Desired temperatures are easily maintained within a close range. Heat is uniformly distributed in the working zone by forced air circulation. It is a very flexible system because different or changing heating requirements are easily satisfied by means of different models, a range of capacities, single- or two-speed motors and individual thermostatic controls.



Low first cost Unit heaters are so efficient and so compact that their heating capacity is often equivalent to the capacity of cast iron radiation or pipe coils of twice the cost. Additional savings are effected because the system requires a proportionately smaller amount of pipe, fittings and accessories.



Economy of operation Heat is forced down to the working level . . . not banked uselessly at the ceiling level. Heat is turned on and off merely by throwing a switch either manually or automatically by simple thermostatic controls. The rapid response means that heat is furnished only when and where it is wanted . . . no heat is wasted.



Adaptability to equipment and floor layout Unit heating is widely used in industrial plants and warehouses, garages, stores and public buildings. The units and the simple piping are overhead where they do not interfere with arrangement of operating machinery or equipment and do not take up valuable floor or wall space. Units are easily relocated at any time to meet changes in layout.

Thermolier unit heaters have important construction advantages The design of Thermolier unit heaters is the product of Grinnell Company's ninety-nine years of heating experience. Those responsible for heating like Thermolier's durability, freedom from maintenance troubles and dependable operation. Typical of its construction features is the patented internal cooling leg which permits the use of a plain thermostatic trap, the simplest, least expensive kind of trap. Other features are built-in drainage, continuous rated capacity and provision for expansion of U-tubes.

100th ANNIVERSARY — PIPING

GRINNELL

Thermolier unit heaters

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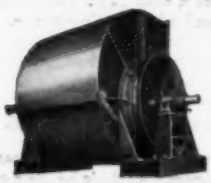
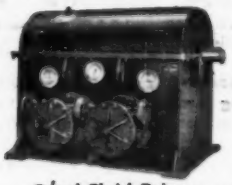
Solve your *fly ash problem* with an AMERICAN BLOWER FLY ASH PRECIPITATOR

Type ST Fly Ash Precipitator

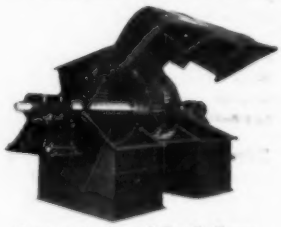
Heavy Duty Coils



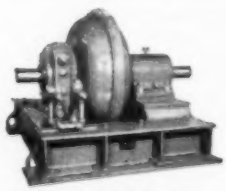
American HS Forced Draft Fans



Gyrol Fluid Drives for Boiler Feed Pumps



Sirocco Induced Draft Fans



Gyrol Fluid Drives for Mechanical Draft Fans

There are many advantages in using American Blower Type ST Precipitators for fly ash problems. Unique in design, simple in operation and low in maintenance cost, these units contribute materially to over-all power plant efficiency.

They automatically maintain high efficiency over the entire boiler load. Even at reduced loads, when fly ash is more difficult to remove, the Type ST Precipitator is relatively more efficient.

In addition, all element cells are die-formed, interchangeable and housed in a single, compact casing. Type ST units are flexibly designed to fit the job. They may be shipped for field assembly, or semi-assembled. They're available in a wide range of sizes to meet a variety of needs.

If you have a fly ash problem, why not call in an American Blower Field Engineer and work your needs out together? He has a wealth of experience behind him and excellent firsthand data at his disposal on Fly Ash Precipitators as well as on American Blower Heavy Duty Coils, Mechanical Draft Fans and Gyrol Fluid Drives for fan control and boiler feed pumps. Simply contact the nearest American Blower Branch Office—conveniently located in all principal cities.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

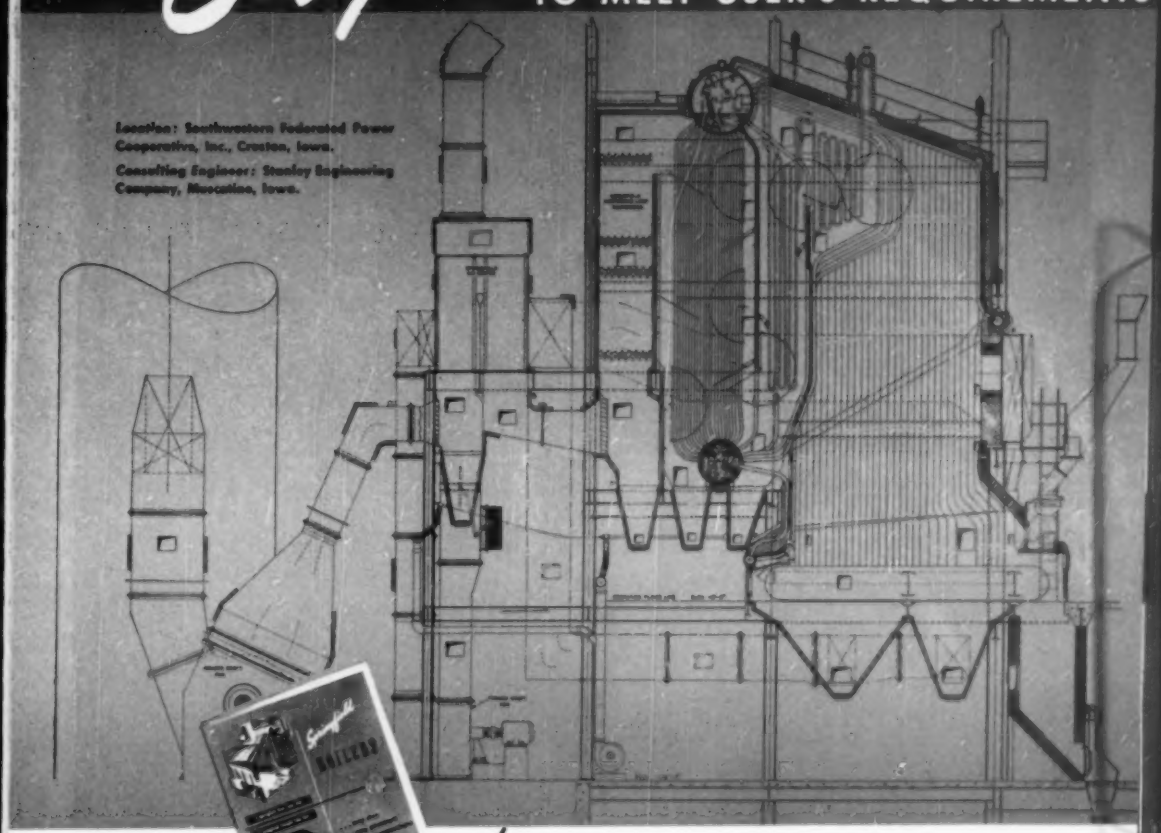
YOUR BEST BUY AMERICAN BLOWER POWER PLANT EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

SPRINGFIELD *Engineered!*

TO MEET USER'S REQUIREMENTS



Location: Southwestern Federated Power Cooperative, Inc., Creston, Iowa.

Consulting Engineer: Stanley Engineering Company, Muscatine, Iowa.

See our catalog in SWEET'S

FINEST ENGINEERING is reflected in Springfield designs for complete steam generating units produced to meet the user's individual requirements. The design shown here is a typical example of the *plus value* offered by Springfield. This is one of two new 100,000 lbs.—700 p.s.i. units for the Creston, Iowa, station of the Southwestern Federated Power Cooperative, Inc. In service, each unit is designed to operate continuously at 90,000 lbs. per hour and 610 p.s.i. pressure with 825°F. total steam temperature at superheater outlet. Firing is by spreader stoker with burners also installed for use of gas as auxiliary fuel.

Capitalize on Springfield's skill and 60 years of continuous specialization in boilers! See your local Springfield representative or write.

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1957 E. Capitol Ave., Springfield, Illinois, U.S.A.

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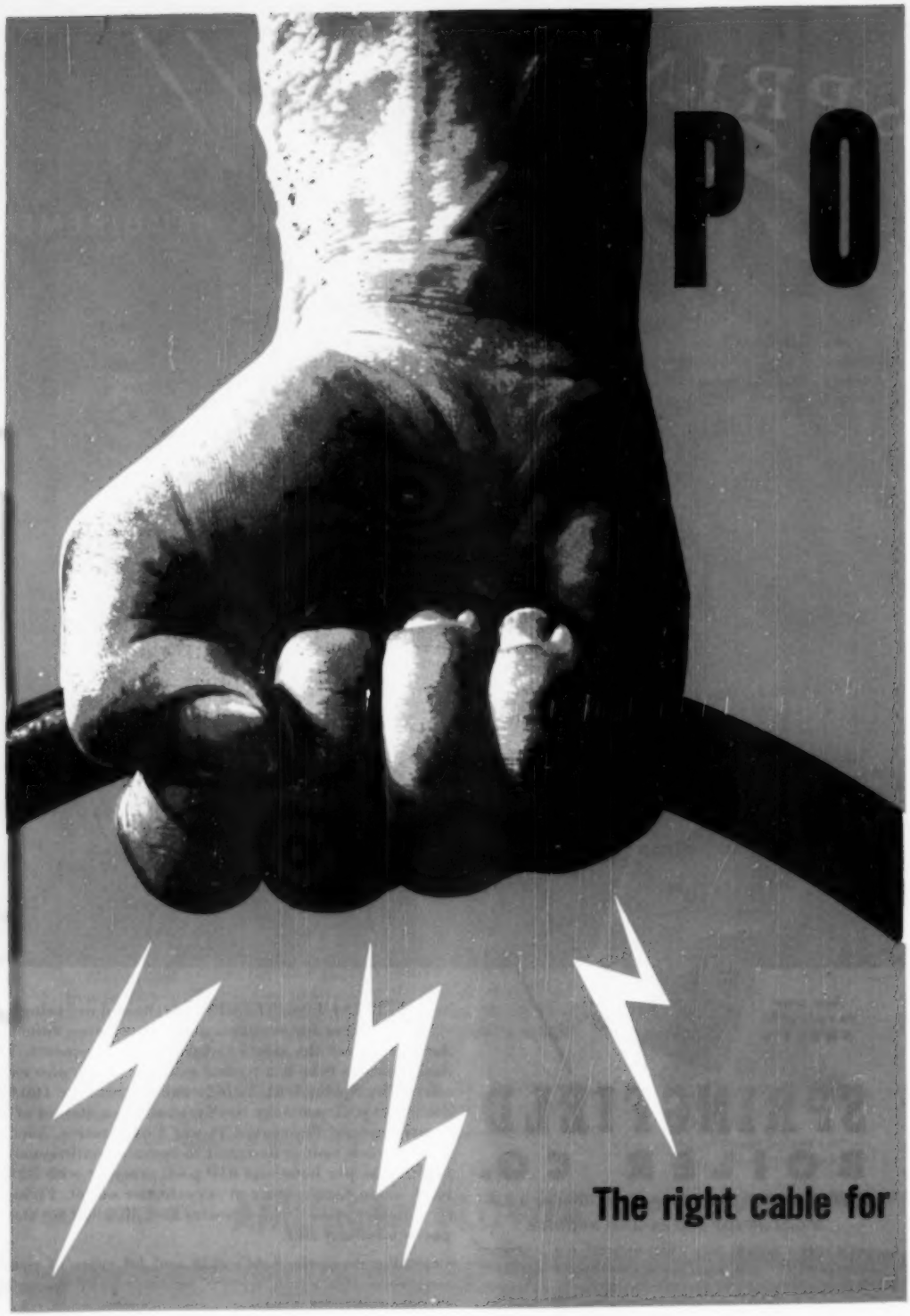
CHECK WITH YOUR CONSULTING ENGINEER ON MODERNIZATION AND NEW PLANT PROJECTS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The right cable for

WER UP

and be prepared!

THAT'S THE CHALLENGE to 9 out of 10 industrial plants—and yours may be one! It's the challenge to prepare those plants to make full use of electric power by modernizing obsolete, worn out wiring systems, by providing adequate wiring capacity *now* and for the *future*.

POWER UP—And Be Prepared! is Anaconda's new Industrial Wiring Modernization Campaign to help industry make full, efficient use of the electric power it buys . . . to eliminate costly power waste caused by overloaded circuits, worn out electrical equipment, inefficient distribution and failure to provide for added power loads.

LIKE ANACONDA'S previous industry-wide campaigns, "Industrial Modernization," "Preventive Maintenance" and "Wire Ahead," this newest Anaconda program is designed to enlist the engineering knowledge and skills of Electric Utilities, Contractors and Wholesalers in helping American industry to POWER UP—And Be Prepared!
Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

the job **ANACONDA®** Wire and Cable

GET longer wear with R/M NO. 920 the flexible metallic packing

R/M No. 920 is one of several R/M metallic packings that combine long-wearing quality with an anti-frictional surface that preserves rod or shaft. R/M No. 920 is made of asbestos yarns covered with metal foil, a combination that is highly resilient and flexible. Recommended for steam and air rods, centrifugal pump shafts, valve stems, expansion joints, and applications where temperature does not exceed 450°F. and surface speed is not greater than 600 feet per minute.

For complete information about R/M No. 920 and the full line of R/M packings, see the authorized R/M packing distributor near you, or mail the coupon below.

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FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.

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Gentlemen: Please send me data on R/M No. 920. **SPI-90**

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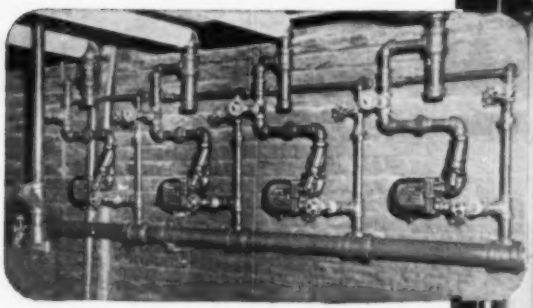
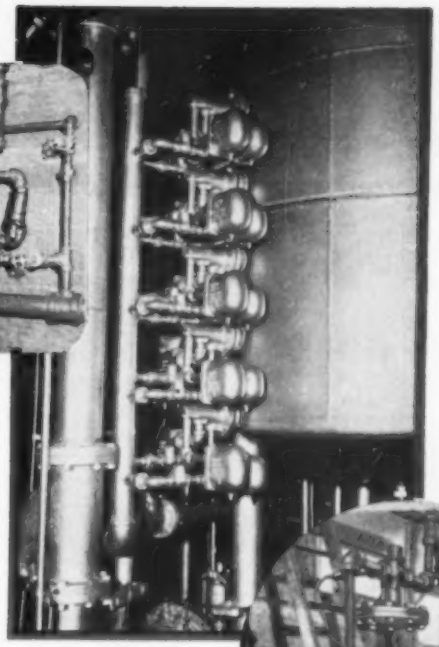
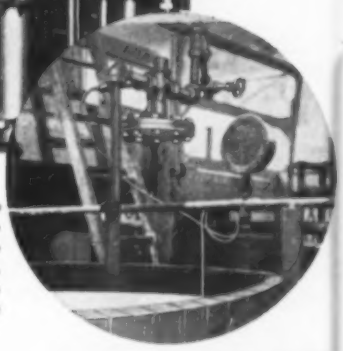
First we make sure of hot, dry steam at the inlet.





Then we select the best of four distinct types of steam traps to remove all condensate without steam waste.

GET YOUR STEAM SYSTEM *Rationalized* WITH SARCO



If automatic temperature control is indicated, Sarco can choose from a wide range of self-operated, pilot or electric controls to do the job at minimum cost.

Operating a steam process with maximum efficiency is more than buying a few steam traps and air vents—it is more than haphazardly applying a few temperature controls.

If it means dollars to you in increased production, improved quality and fewer rejects—it will pay you to let the Sarco man near you make a survey of your needs.

He will come up with definite, practical suggestions of how you can do a better job and save steam besides. Write today—there is no obligation.

The new Sarco draining and venting system for dry cans will save at least 20% warm-up time.

307

SARCO SAVES STEAM

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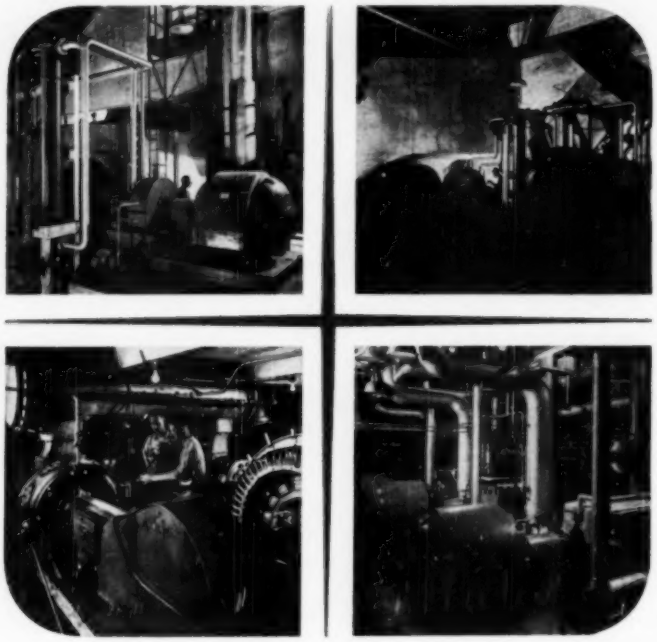
IMPROVES PRODUCT QUALITY AND OUTPUT

* *5 reasons why*

the new improved Gulf Harmony Oil

can cut your maintenance costs

for pumps, compressors, and other oil-lubricated auxiliaries



* GREATER RESISTANCE TO SLUDGING

* NON-FOAMING

* PROVIDES SURE PROTECTION AGAINST RUST

* GOOD WATER SEPARATING CHARACTERISTICS

* HIGHER LUBRICATING VALUE

Here's an oil that can save you a lot of maintenance dollars! The new improved Gulf Harmony Oil provides outstanding protection for pumps, compressors, motors, fans, and other oil-lubricated plant equipment. Also ideal for hydraulic applications.

Gulf Harmony Oil is enriched with a remarkable new oxidation stabilizer—another important Gulf Research development. This additive improves the already outstanding chemical stability of Gulf Harmony Oil—gives it exceptional resistance to sludging. This means cleaner reservoirs, hydraulic systems, and antifriction bearings and it outlasts competitive oils.

Gulf Harmony Oil has been fortified to provide an even more effective rust preventive film. Now you can be sure of full protection against rust for all oil-bathed surfaces. It is particularly effective for ball and roller bearings operating under wet conditions and it separates readily from water. This outstanding oil provides more effective protection for bearings, gears, hydraulic mechanisms, and compressor cylinders. Available in a wide range of vicosities.

For more complete information on Gulf Harmony Oil, call in a Gulf Lubrication Engineer today. Write, wire or phone:

Gulf Oil Corporation · Gulf Refining Company

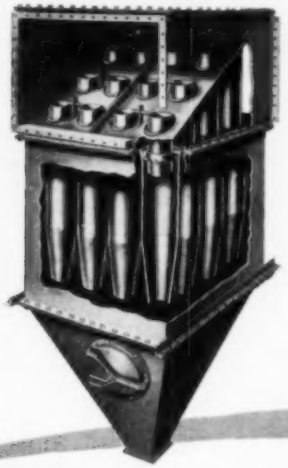
GULF BUILDING, PITTSBURGH, PA.

Sales Offices - Warehouses

Located in principal cities and towns throughout Gulf's marketing territory

GULF INDUSTRIAL LUBRICATION

Before you buy *any* equipment for recovering dust or fly ash . . .



COMPARE ALL OTHERS against MULTICLONE'S Multiple Advantages

Because the advantages of MULTICLONE are so clear-cut, so vitally important, so far-reaching in the savings they make, we urge you to make a factual unbiased comparison of MULTICLONE dust and fly ash collection equipment against *any other* in the mechanical recovery field. Only by making such a comparison can you fully appreciate the major savings and greater performance you get by installing MULTICLONE Collectors!

COMPARE Recovery Efficiency!

It is a recognized fact that the *separating efficiency* of a cyclonic tube *increases* as the tube diameter *decreases* because smaller tubes generate greater centrifugal forces. The patented vane in the MULTICLONE makes the use of small tubes *practical* without complicated manifolding and permits compacting many small tubes into one simple, highly efficient unit. MULTICLONE's higher centrifugal forces throw out not only the large, medium and small particles, but also an unusually high percentage of the *extremely small* particles of 10 microns and less. Result—*more complete recovery of all suspended particles from the gas stream!*

COMPARE Space-Saving Compactness!

Plant space costs money—particularly at today's high construction costs. Because the MULTICLONE is more compact, size for size, it makes *really important* savings in space and plant costs. Note in the chart how the MULTICLONE requires substantially less space—*both in floor space and cubic space*—than any other unit of comparable capacity and performance. *This means vital savings in construction costs!*

Make	Relative Space Requirements In Sq. Ft.	In Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.8	3.9

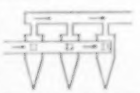
COMPARE Dollar-Saving Adaptability!

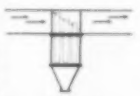
Savings in space is just one of many ways MULTICLONE reduces installation costs. Because the shape of the unit can be readily varied (long and narrow, short and wide, or square) to fit available spaces, the MULTICLONE can often be tucked into odd corners and waste areas too restricted for other equipment.

Moreover, inlet-outlet ducts can be varied—side-inlet side-outlet, or side-inlet top-outlet—to meet low headroom or restricted side clearance requirements . . . and the single-inlet single-outlet duct design permits greater flexibility and simpler installation. *These all add up to vital savings in installation costs!*

COMPARE All-Around Simplicity!

The MULTICLONE is simple and inexpensive to maintain because there are no high-speed moving parts to repair or replace . . . no pads or filters to clean or renew . . . nothing to choke the gas flow or increase draft losses as suspended materials are recovered. In addition, the square, flat-sided shape of the MULTICLONE and its straight inlet and outlet ducts are far simpler to install and insulate. And since the recovered material from an entire bank of tubes is collected in a *single* hopper, it is much easier to service and maintain than the multiple hoppers of conventional cyclone units. *Here again, the* MULTICLONE *saves in many ways—all of them important!*


Conventional Cyclone


Multiclone

Whether your recovery installation is in a new structure or for modernizing present equipment, you will be far ahead by installing MULTICLONE Collectors. Our experienced engineers will gladly make helpful suggestions for simplifying your recovery problems. A letter, wire or call to our nearest office places this assistance at your service without obligation.

Send for Helpful Literature! This factual MULTICLONE literature explains the basic principles of cyclonic dust recovery and gives technical data helpful to anyone contemplating a dust or fly ash recovery installation. Write today for your free copy!

WESTERN Precipitation CORPORATION

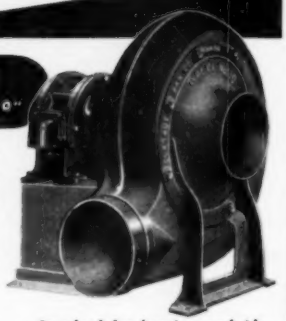
ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1032 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 1 LaSALLE ST. BLDG., 1 N. LaSALLE ST., CHICAGO 2 • HOBART BUILDING, SAN FRANCISCO 4, CALIFORNIA
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

Good Horse Sense . . . to Use These HEAVY-DUTY CLARAGE FANS

TYPE CI EXHAUSTERS

Capacities to 4000 CFM; Pressures to 20"



Nothing shoddy or flimsy about these smaller Clarage industrial fans. They are O.K. for continuous service — built to the *same exacting standards* as the largest Clarage equipment.

Try them! . . . then you will readily understand why we call them "HEAVY-DUTY" — *and mean just that!*

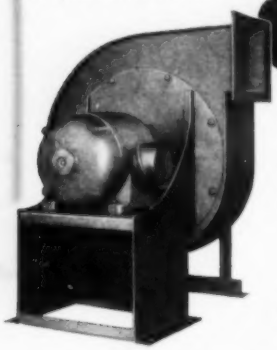
Use Clarage Type CI Exhausters for removing excess heat, dust, smoke, odors from any manufacturing operation — for supplying air to oil burners, as over-fire fans, etc. Use them for pneumatic conveying.

Fans also can be furnished gas tight, rubber covered, or with vulnerable parts of stainless steel or Monel — in fact, *in any construction* your special needs demand.

Standard fan housings and side plates are cast iron, long wearing, long resisting to corrosion. Heavy steel plate wheels are perfectly balanced. Fans in each of the 6 sizes can be V-belt or direct motor driven.

TYPE O BLOWERS

Capacities to 30,000 CFM; Pressures to 35"



Another Clarage HEAVY-DUTY industrial fan! Use Type O Blowers for *high pressure* applications — supplying air to cupolas, gas and oil burners, etc. Fan housings and wheels are heavy steel plate equal to severest conditions. Built in 19 sizes, operating at speeds *most economical* for direct motor or steam turbine drive.

WE ALSO MAKE:

LARGE INDUSTRIAL FANS
AIR CONDITIONING EQUIPMENT
AIR WASHERS UNIT HEATERS

CLARAGE FAN COMPANY – *Kalamazoo, Michigan*

CLARAGE

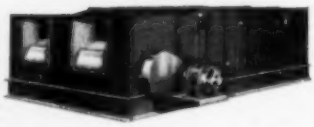
—*HEADQUARTERS* for Air Handling and Conditioning Equipment

SEE OUR CATALOG IN SWEET'S

It pays to direct fan inquiries our way . . . phone Clarage office in your city, or write us at Kalamazoo.

Application Engineering Offices in All Principal Cities

Wherever an Air CLEAN-UP is Required . . .



Clarage Capillary Conditioners Guarantee a Thorough Job!

Here are units that "wrap in a single package" the answers to (1) **maximum air cleanliness,** (2) **accurate temperature control,** (3) **close humidity regulation.**

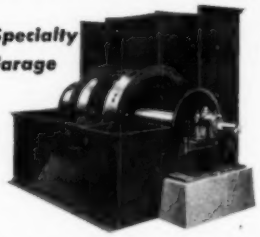
A Clarage Air Conditioner of this type includes a capillary cleaning section, pump, heating coils, fans, drive, and motor. Completely assembled — as either vertical or horizontal units — they install quickly and inexpensively. No additional parts or costly building alterations required. Seven sizes available — delivering from 1,800 to 20,000 cubic feet of air per minute.

Yes, where **thoroughly conditioned air** is vital to production, uniformity of product, health, or safety, there are many good reasons for choosing this modern equipment. Dependable performance is promised by scientific factory testing; **low first and operating costs** assured by Clarage's advanced engineering.

★ ★ ★

MECHANICAL DRAFT FANS

. . . a Specialty with Clarage



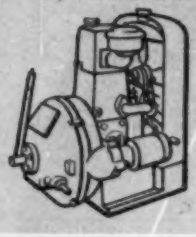
Recognized champions in the heavyweight class are these Clarage Fans for induced and forced draft service.

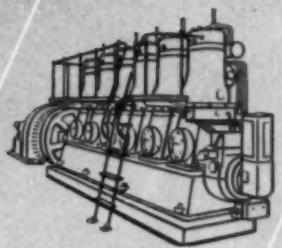
In thousands of central stations and industrial power plants Type RT Fans have proved — **and annually continue to prove** — their ability to withstand severest operating conditions. Shaft and bearings are EXTRA large; wheels EXTRA heavy; all points of stress HEAVILY reinforced!

Whenever air must be handled at high temperatures, high pressures, OR BOTH — for many industrial processes as well as in mechanical draft service — Type RT fans write outstanding performance records.

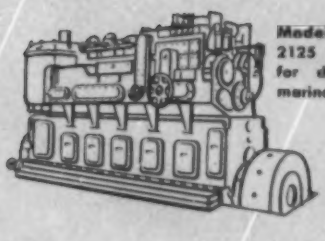
CLARAGE FAN COMPANY, Kalamazoo, Mich.

Model 45B: 5¼ horsepower engine for stationary and marine service.



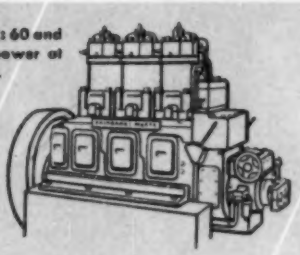


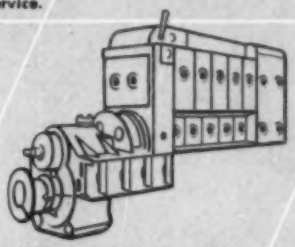
Model 32: Horsepower from 120 to 450. For slow-speed heavy- duty service.



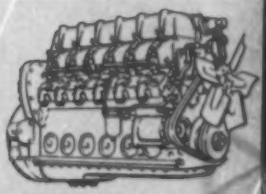
Model 37: 500 to 2125 horsepower for direct drive marine service.

Model 42: 60 and 90 horsepower at 450 r.p.m.

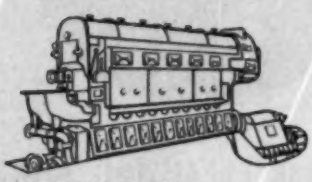




Model 31: Horsepower from 175 to 500; with 2 to 1 reduction gears optional for marine service.

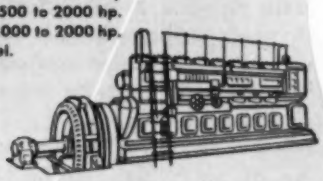


Model 49: Marine Engine: Also available for stationary or portable service. 20 to 150 hp.



Model 38 Opposed-Piston Engine: Horsepower from 960 to 1920 with 2 to 1 reduction gear for marine service.

Model 33 Stationary Engine: 500 to 2000 hp. Diesel, 1000 to 2000 hp. Dual Fuel.



When it comes to Diesel Power...

From 3.5 hp. to 3500 hp.

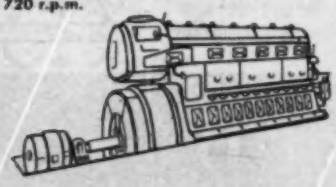
Low-cost, efficient power for all marine services . . . modern, dependable power for newest, fastest road locomotives . . . economical power for largest to smallest municipal and industrial plants . . . Fairbanks-Morse is the proved source for the full range of diesel applications. For skilled assistance and impartial recommendation for the diesel for your specific service, write Fairbanks, Morse & Co., Chicago 5, Ill.

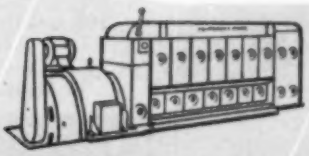
FAIRBANKS-MORSE,

a name worth remembering

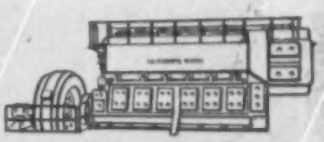
DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • PUMPS • SCALES
HOME WATER SERVICE AND HEATING EQUIPMENT • RAIL CARS • FARM MACHINERY

Model 38 Opposed-Piston Engine: 960 to 1920 horsepower at 720 r.p.m.





Model 31: Diesel generating set with kw. ratings from 118 to 360. Marine and stationary—Dual Fuel available in larger sizes.



Model 31: 2100 to 3500 horsepower diesel or dual fuel engine for heavy-duty stationary service.

Note sturdy construction. The arrow in photo below points to one of the steel reinforcing rings.

GARLOCK RUBBER EXPANSION JOINTS

resist cracking and corrosion— and do not take a permanent set

GARLOCK RUBBER EXPANSION JOINTS hold up under repeated flexing caused by expansion, contraction and vibration of the pipe line, because they are constructed of high grade rubber which is combined with plies of sturdy cotton duck and reinforced with steel wire or rings. Where oil resistance is necessary, neoprene joints are available.

For all pipe sizes from 2" to 72", including tapered joints. Specify No. 204 for *Pressure;* 205 for *Vacuum;* 206 for *Pressure and Vacuum.* Write for descriptive folder.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK

In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

GARLOCK

Integrator

Varying flows are accurately totalized because the integrator is continuous

Indicator-Recorder-Integrator

The Republic flow integrator, being of the modified watt-hour type, totalizes continuously—not intermittently. It operates independently of the recorder and its accuracy is not dependent on or affected by any clock mechanism or mechanical action.

The Republic meter is, on this account, peculiarly fitted to follow all changes in flow rate and accurately measure highly fluctuating flows.

ALL TYPES OF FLUIDS

Republic electric type flow meters are available for measuring the flow of all types of liquids and gases. Meter bodies are built for metering fluids at line pressures up to 5,000 lb. per sq. in. and for all ranges of differential pressure. The reading instruments—indicator, recorder and integrator—are of the remote reading type and can be located any distance from the point of flow measurement.

ANY COMBINATION

While each Republic reading instrument is standard in design and construction each is especially calibrated for the particular flow measurement for which it is specified. Any reading instrument, indicator, recorder or integrator, may be obtained separately or in any combination desired, making possible the highest degree of flexibility in plant use.

SIMPLE IN OPERATION

The Republic electric meter is the only flow meter commercially manufactured which is strictly electric in its operation. All other types of so called electric meters use the motion of the mercury to move a float or produce a force which is then converted into an electrical value which is in turn transmitted to a receiving or reading instrument. In the Republic meter, the transmitted electrical value is determined directly by the mercury motion, thus eliminating one of the steps in the sequence, and simplifying the mechanism to that extent. There are no floats, levers, cams, rotating shafts or anything else to interfere with the unimpeded movement of the mercury, which has no work to perform, but merely fulfills the function of making contact.

NEW DATA BOOK

Just off the press—a completely new data book describing and illustrating, in detail, the operating features of the Republic Flow Meter and its many applications. Write for your copy of Data Book No. 702—there is no obligation.

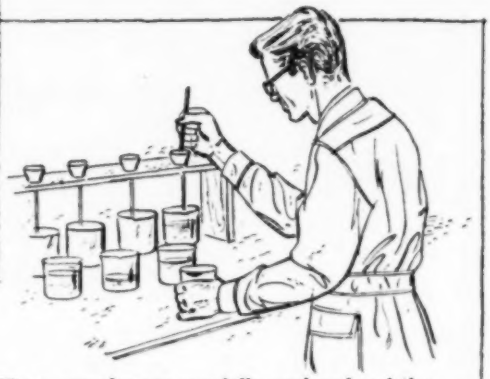
REPUBLIC FLOW METERS CO. ● 2240 DIVERSEY PARKWAY • CHICAGO 47, ILLINOIS

a Continuing Review of Conditions

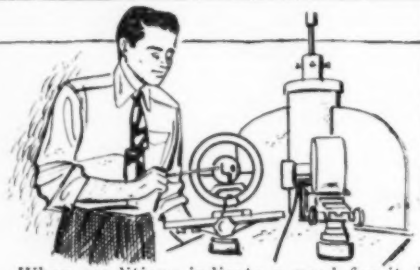
WITH HALL BOILER WATER CONDITIONING

When the Hall System of boiler water conditioning gets under way in a plant, the boiler operator can usually maintain desired conditions without difficulty. Nevertheless, he is not left entirely "on his own," for Hall continuously reviews conditions and treatment.

From time to time water samples are sent to Hall Laboratories, together with the operator's report of his test results on that water.



These samples are carefully analyzed and the analysis compared with that of the boiler operator, so that he has a check on his work.



When conditions indicate a need for it, boiler deposits are also analyzed, using chemical, X-ray, spectrographic and other methods as required.

As a result of this continuing review, the boiler operator can be confident that he is handling the water treatment properly, and that he will not be caught unaware by any change in conditions.

The continued attention which Hall Laboratories gives to every client is another reason why so many plants of all sizes, in all parts of the country, continue to use Hall Service, year after year. Hall Laboratories, Inc., Hagan Building, Pittsburgh 30, Pa.

HALL LABORATORIES, INC.

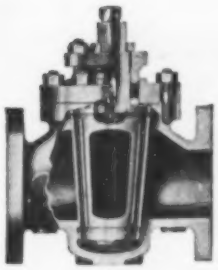
(A Subsidiary of Hagan Corporation)

CONSULTANTS ON
INDUSTRIAL WATER TREATMENT

HALL SYSTEM OF BOILER WATER CONDITIONING

INDUSTRIAL WASTE RECOVERY AND DISPOSAL

• VALVES
• PIPE FITTINGS



Walworth
Lubricated Plug Valve

Walworth
Steel Gate Valve

Walworth
Iron Body Gate Valve

Walworth
"500 Brinell" Bronze Globe Valve

Walworth
Iron Body Saddle Gate Valve

Walworth
Cast Steel Flanged Fittings

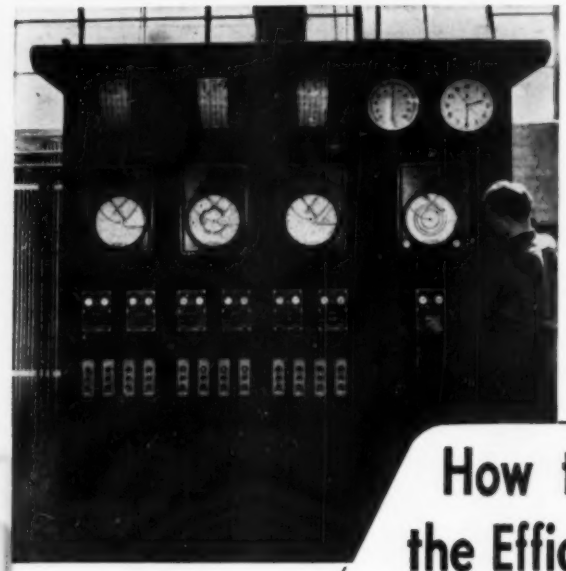
Walworth manufactures a *complete line* of valves and pipe fittings: all made to the highest standards of quality, both as to dimensional accuracy and metallurgical properties. In design, construction, and performance, Walworth products reflect more than a century of experience in the manufacture of quality valves and fittings.

Your Walworth distributor will give you full information on the *complete line* of Walworth steel, iron, and bronze, and special alloy valves and pipe fittings; also Walworth Lubricated Plug Valves, and Walseal* valves, fittings and flanges. Ask for this information today.

*Patented—Reg. U. S. Pat. Off.

WALWORTH
valves and fittings
60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



These Bailey Boiler Controls at the Chicago Pneumatic Tool Company's new plant in Utica, N. Y. insure efficient operation of three 25,000 lb per hour, 100 psi, spreader stoker-fired boilers

How to INCREASE the Efficiency of YOUR BOILER-ROOM DOLLAR

Before you get steam you've got to spend dollars—so dollars are a form of energy.

And if your boiler-room dollars are invested in equipment that isn't working efficiently, economically, your "investment" is poor.

That's where co-ordinated controls by Bailey can help. Here's why they'll increase your "boiler-room investment efficiency":

1. **Complete Range of Equipment—fully co-ordinated.** You need never worry that a Bailey Engineer's recommendation is slanted in favor of a particular type of equipment, just because he has a limited line to sell—or that Bailey will pass the buck for efficient control; we offer *complete* boiler control systems.

2. **Engineering Service—backed by experience.** No other manufacturer of instruments and controls can offer as broad an experience, based on successful installations involving all types of combustion, flow measurement and automatic control.

3. **Direct Sales-Service — conveniently located near you.** Bailey Meter Company's sales-service engineers are located in more industrial centers than those of any other manufacturer of boiler control systems; you get prompt, experienced service with a minimum of travel time and expense.

•

For better "boiler-room investment" efficiency —for more power per fuel dollar, less outage and safer working conditions, you owe it to yourself to investigate Bailey Controls. Ask a Bailey engineer to arrange a visit to a nearby Bailey installation. We're proud to stand on our record: "More power to you!"

A-111-0

BAILEY METERS

BAILEY METER COMPANY

1028 IVANHOE ROAD
CLEVELAND 10, OHIO

Controls for Steam Plants
COMBUSTION · FEED WATER
TEMPERATURE · PRESSURE
LIQUID LEVEL · FEED PUMPS

write wire or phone

for steel in a *hurry!*

DIRECT FROM WAREHOUSE TO YOU

One of the South's largest varieties of steel products is ready for rapid delivery to you, whether you need one piece or a hundred!

Hot-rolled rounds, squares, flats, strip, sheets and plates • Structural angles and channels • I-beams and H-beams • Stainless steels • Rigidized metals • Cold-rolled sheets, rounds, squares and flats • Galvanized sheets • Copper sheets and strip • Screw stock • Bolts, nuts and rivets.

There are plenty of others! Write for our complete list of products and prices.

Service in Step with Southern Progress

WAREHOUSE DIVISION

Atlantic Steel Company

ATLANTA, GEORGIA • EMERSON 3451

- Assured Safety
- Efficient Operation
- Minimum Fuel Costs
- Low Maintenance
- Long, Trouble-Free Life

MADE SIMPLE BY NAVCO

The high degree of skill acquired by Navco Engineers from long experience in solving unusual Piping problems is your guarantee of an accurate and workmanlike Piping System.

Consult Navco for your next Piping Job

NAVCO

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NATIONAL VALVE & MANUFACTURING COMPANY • PITTSBURGH, PA.

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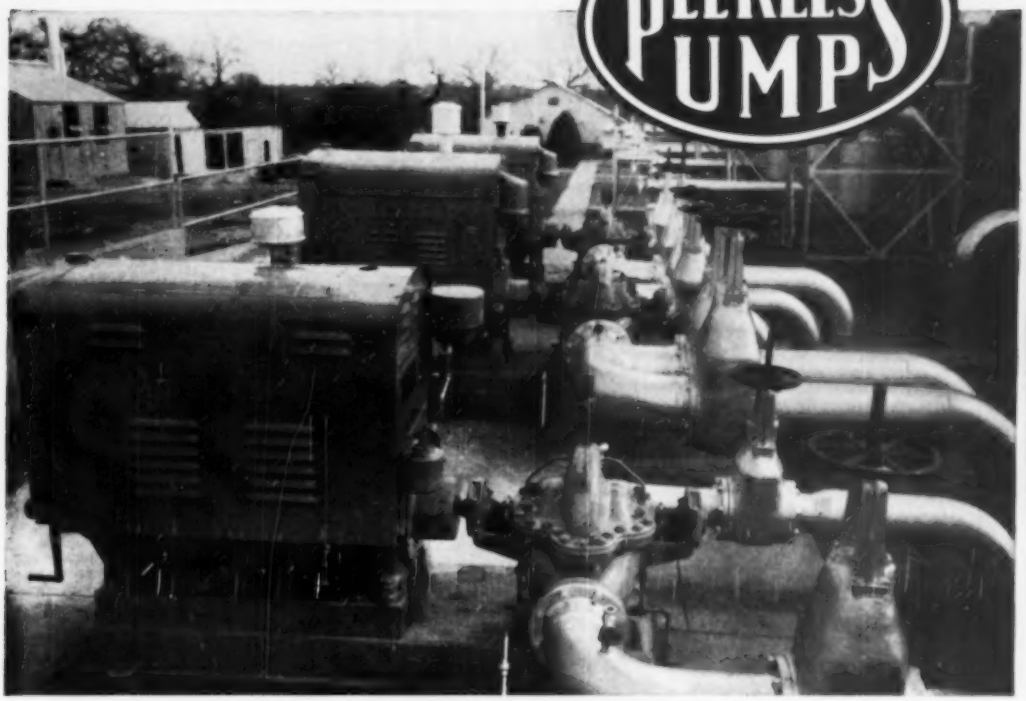
PEERLESS PUMPS PREFERRED

VERSATILE CONTINUOUS-DUTY GENERAL PURPOSE TYPE A PEERLESS PUMPS



Peerless Type A Horizontal Centrifugal Pumps Used in Gas Booster Station for Handling Jacket Cooling Water

Peerless Type A general purpose horizontal centrifugal pumps are preferred by this large producer of natural gas, for a host of reasons. Here are a few of the features that contribute to their unsurpassed performance:

1. Employ duplex angular contact thrust bearings for longer life and lower maintenance cost, under heavy continuous or intermittent duty.
2. Bearing housings have double-wall construction; first, to insure against any distortion of ball race and second, to provide water-cooling space between walls.
3. Impeller rings are generously wide and grooved; efficiency is increased by minimizing leakage between suction and discharge chambers.
4. Heavy case rings, with ribs on both ends, provide extra strength, prevent distortion and effect a seal against leakage.
5. Shaft sleeves, locked against direction of rotation by right and left hand threads at impeller hub, prevent shaft distortion when handling hot liquids.
6. Incorporate five rows of heavy duty packing and utilize an in-and-out water seal connection for use when handling hot liquids.

These general purpose pumps are completely described in Peerless Bulletin B-1300. Write for your copy.

TYPE A PUMP CHARACTERISTICS

CAPACITIES: Up to 70,000 GPM
HEADS: Up to 300 Ft.
SIZES: 1½" to 48"
LIQUID TEMPERATURES: Up to 300° F
SINGLE STAGE – DOUBLE SUCTION
HORIZONTAL SPLIT CASE

APPLICATIONS:

BOOSTER STATIONS
WATER SUPPLY
COMMERCIAL BUILDINGS
INDUSTRIAL PROCESSING
WASTE DISPOSAL
COOLING AND REFRIGERATION
FIRE PROTECTION

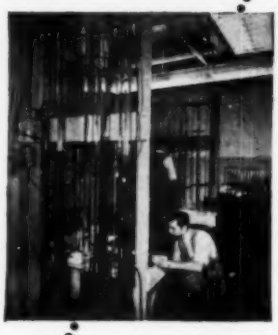
PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Factories: Los Angeles, California, and Indianapolis, Indiana.
Offices: New York, Atlanta, Chicago, St. Louis, Phoenix, Fresno, Los Angeles; Dallas, Plainview and Lubbock, Texas; Albuquerque, N. M.

3 steps to successful

ION EXCHANGE PERFORMANCE

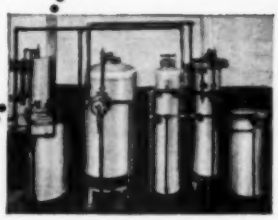
Whether it is a simple greensand softener or a large demineralizing plant, these three essential steps are necessary to produce an ion exchange installation which:

- is easy to operate
- requires low chemical regenerating costs
- yields uniformly dependable performance



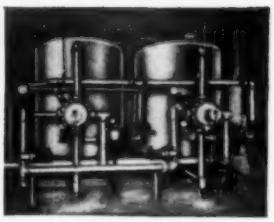
LABORATORY RESEARCH

Graver chemists and technologists are continually evaluating the performance of many ion exchangers to determine the optimum operating conditions for each. As a result of this work the specific advantages of more than forty available Graver ion exchangers can be effectively applied to a wide range of processes.



PILOT PLANT OPERATION

Graver development engineers regularly conduct tests on small scale pilot units operating under simulated plant conditions. These tests serve to check laboratory experiments and to work out problems in mechanical design. This assures dependable operation of the ion exchange equipment under actual service.



COMMERCIAL EXPERIENCE

A background of thirty years' successful commercial experience is reflected in the design of Graver equipment. Graver chemical engineers have pioneered the commercial application of many new ion exchange processes. Dependable service is assured as a result of this experience.

Write for the following reprints:

"Operating experience with Resin Zeolites on the Hydrogen Cycle"

"Present Practices in the Use of Ion Exchangers in Water Treatment"

"Silica Removal by a Practical Ion Exchange Process"

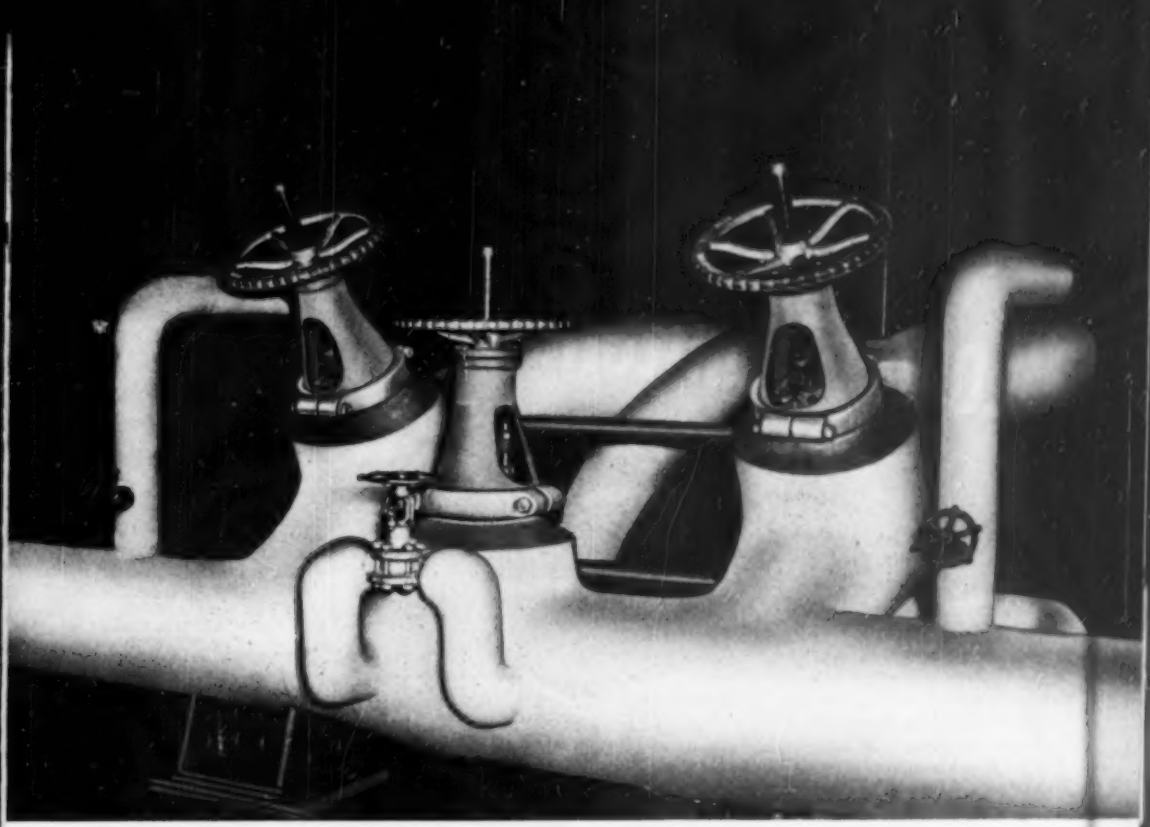
GRAVER WATER CONDITIONING CO.

216 West 14th Street, New York 11, New York, U.S.A.

GW-425

GRAVER

A DIVISION OF GRAVER TANK & MFG. CO. INC. EAST CHICAGO, IND.



FORGET IT!

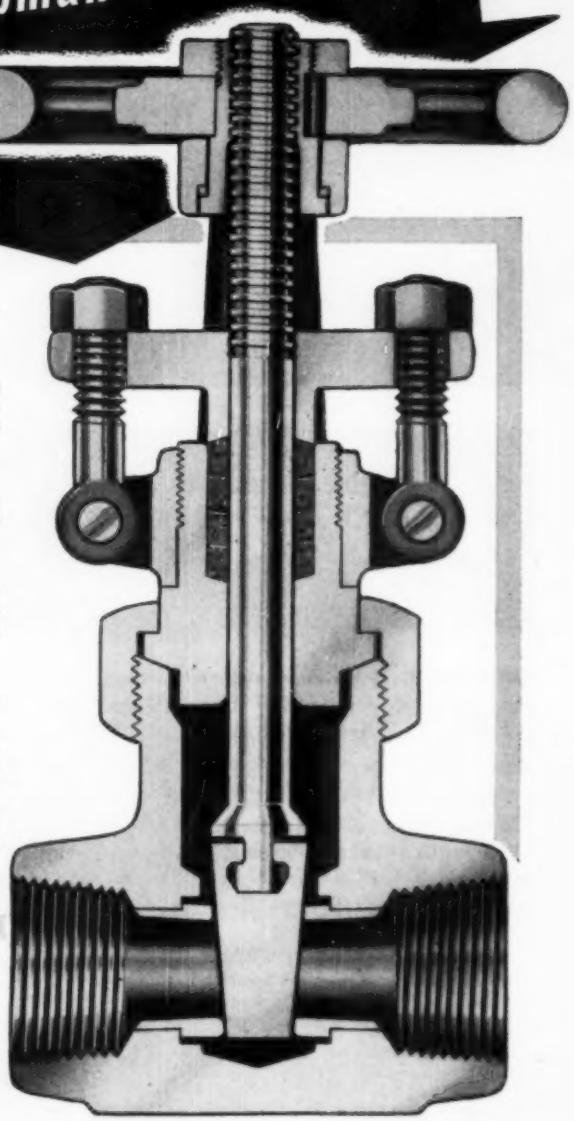
OUT OF SIGHT, down under the coal bunkers, this Blaw-Knox piping assembly supplies feed water to main boilers in a great new Wisconsin power plant—temperature 450° F., pressure 1350 psi. In spite of its importance, it will soon be forgotten, for it functions without attention—out of sight!

The assembly was designed and built to outlive the big plant of which it is a vital part. Blaw-Knox engineers, fabricators, and erectors stake an enviable reputation on the life-long services rendered by Blaw-Knox Power Piping.

POWER PIPING DIVISION
OF BLAW-KNOX CONSTRUCTION COMPANY
1525 Pennsylvania Avenue, Pittsburgh 12, Pa.

BLAW-KNOX *Power Piping*

Here's Why You Get
Lower Maintenance Costs
with Chapman List 960



1. *Gaskets!*
Available with either metal to metal or gasketed joint as required.

2. *50% Stronger!*
New design features compensate at points where excessive strain can develop . . . make stem and wedge gate connection 50% stronger than before.

3. *Wear-Resisting Wedge Faces!*
To keep your maintenance cost down the wedge faces are hardened to 800 Brinell by the exclusive Malcomizing process.

4. *Replaceable Seat Rings!*
When necessary, you can replace the seat rings easily . . . fast. Seat rings have wear-resisting and non-galling properties . . . made extra hard for years more service.

5. *Full Pressure Repacking!*
No need for costly interruption of flow to repack.

But check this lower maintenance cost for yourself. Next time you buy specify List 960 in sizes from ¼" to 2". Rising stem with yoke (as illustrated) or rising stem inside screw type. For pressure range 2000 lbs. at 100 deg. F., 380 lbs. at 1000 deg. F. Specify List 990 for higher pressures.

The CHAPMAN Valve Manufacturing Company

INDIAN ORCHARD • MASSACHUSETTS

Timely Comments

FRANK WEIKEL, DIRECTOR OF LABOR RELATIONS, REYNOLDS METALS COMPANY, WATCHES REYNOLDS WORKERS LEAVING THE LOUISVILLE PLANT TO BEGIN CALLS THAT INTRODUCED REYNOLDS WRAP TO 40,000 HOMES.

Union Helps Its Company Sell Product

MORE than 800 men and women who work in Reynolds Metals Company plants staged a sales crusade in Louisville under leadership of officials of the Aluminum Workers Union Local 19388. After doing their daily shift at punch presses and other duties in the plants, they called at more than 40,000 homes, left a sample of Reynolds Wrap and explained the uses of the product. This helpful service to the Company was performed on their own time and without additional compensation.

This unique idea was initiated by Matthew W. Davis, business representative of the union, in conjunction with Philip Farrell, union president. The plan was first presented to J. Louis Reynolds, vice president, who acclaimed the novel proposal. Then the union leaders went to work.

Mr. Davis issued a special bulletin in which details of the plan were explained to the workers. More than 800 hourly workers were selected for the assignment. They were interviewed two and three at a time, given a suggested sales talk and indoctrinated with the idea. Workers were assigned two city blocks each, preferably in the area adjacent to their homes. Each member of the crusading sales organization was equipped with a shopping bag for carrying the samples.

"Our philosophy," said Mr. Davis, "is that the bigger and better and more successful the Reynolds Metals Company is, the more job security we will have."

Richard S. Reynolds, Jr., President of Reynolds Metals Company, was enthusiastic in his commendation of the Union activity. He said: "I take this opportunity to express to Matt Davis, originator of this unusual idea, Phil Farrell, and the entire membership of the Union, the deep appreciation of Reynolds Metals Company for this splendid expression of interest in the Company. This demonstration of your desire to help your Company makes me very happy. Nothing like it has ever happened before. You have blazed a new trail toward improved and intelligent cooperation within our company. I want to assure each of you that I am grateful for this indication of your good will."

Individual Initiative Must Be Retained

MUCH can be said in favor of the new 5-year contracts which have been signed by employers and employees of several large manufacturing companies and a few smaller concerns. Certainly the gains to both parties offered by limiting negotiation of contracts to five-year periods rather than annual periods are appreciable and worth-while. Peace of mind and readiness to work should allow employees to make a real contribution toward improved output, and assurance of a working force at known costs should assist management toward better and more vigorous industrial planning.

If there are any weaknesses or injustices in these agreements, we believe the 5-year contract will strengthen the desire of both parties to correct and improve as years go by. There is, however, one weakness which seems common to this and perhaps all Union contracts. There seems to be an unwritten clause that limits, or tends to limit, individual initiative. Job security, while desirable, does take away some of the natural energy normally generated by the struggle for existence—the effort to stay on top through TOP PERFORMANCE.

Labor relations are improving and must continue to improve. Outstanding group initiative such as that exemplified by the previous item needs encouragement—and individual initiative on the part of each worker needs continuous stimulation.

Smart executives in both industry and Unions should never lose sight of the individual in their planning and negotiating. Each worker is interested primarily in his own welfare—the company and the Union are his way to progress. He does not want to be merely a part of a machine. He wants to be exceptional. He wants to rise above his fellows. And he is willing to work to gain these personal desires. That is what makes America great—opportunity to be somebody.

Much thinking and planning remains to be done if security through group endeavor is to be attained without sacrifice of individual initiative.

Profitable way to purchase piping ... Get everything from CRANE

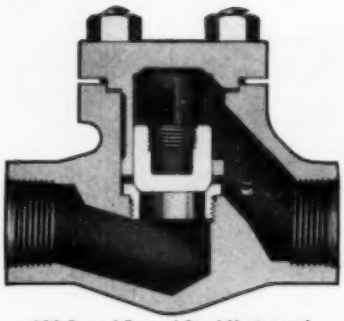
SMALL STEEL LIFT CHECKS WITH BETTER FLOW

Looking for small steel lift checks that don't chatter, and have extremely low pressure drop? Then specify these Crane 600-Pound Forged Steel Lift Checks. They have a patented cap-sleeve construction that provides high disc lift, even at low velocities, thereby eliminating destructive pounding and chattering. Special design of body contours and port openings give unusually low pressure drop.

Seats and discs are of wear-resisting Crane Exelloy. Rugged, forged steel bodies will withstand severe, high pressure services.

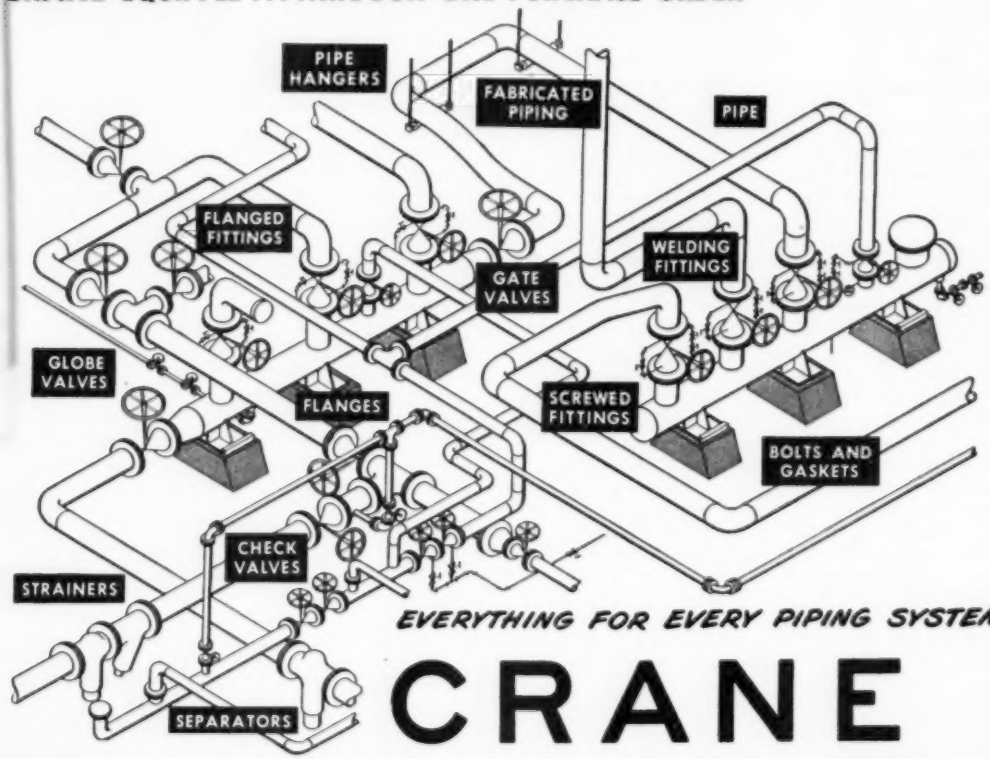
You can get these checks with union caps, screwed or socket welding ends, sizes ¼ through ¾ inches. Or with bolted cap, screwed, socket welding, or flanged ends, in sizes ½ through 2 inches. See your No. 49 Crane Catalog, pages 248-249.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas



600-Pound Forged Steel Horizontal Check with Bolted Cap. For steam, water, air, and gas up to 850° F.; for oil or oil vapor up to 1000° F. Sizes: ½ to 2-in. Screwed, flanged, or welding ends.

THIS HIGH PRESSURE STEAM SYSTEM CAN BE 100% CRANE-EQUIPPED ... THROUGH ONE PURCHASE ORDER



EVERYTHING FOR EVERY PIPING SYSTEM

CRANE

VALVES • FITTINGS • PIPE • PLUMBING AND HEATING

Industry Speaks

More Power for Florida

W. C. GILMAN

President
Florida Power Corporation
St. Petersburg, Florida

The Florida Power Corporation is investing 96 million dollars in plants, substations and lines to take care of the rapid growth of the territory served by the utility, stated W. C. Gilman, president of FPC, at the recent board of directors meeting.

MR. GILMAN pointed out that the construction budget for this year alone will exceed 14 million dollars and the budget for 1951 calls for 15 million dollars—60 million dollars within the next 4½ years. Diversified industry, vast agricultural enterprises, the ever-growing tourist industry, and the continued trend of more and more homemakers to switch to all-electric homes, were some of the basic factors which have prompted Florida Power to carry on this vast construction program.

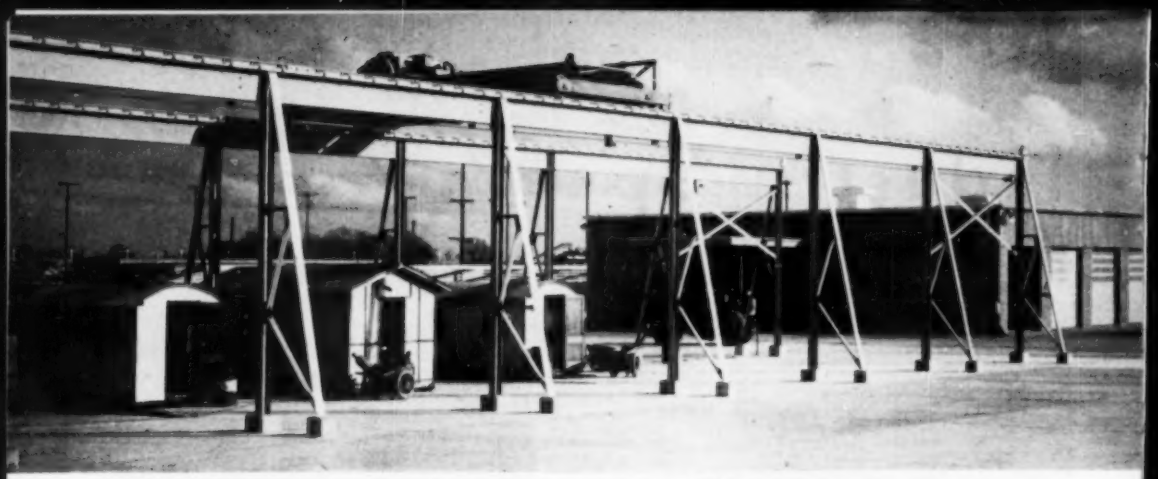
Mr. Gilman pointed out to the board of directors that since World War II many industries have located in Florida and that many others in the North have established branch plants in Florida Power territory. He credited the company's industrial development work in helping to bring the Victor Chemical Works' huge plant and the Diamond Braiding Mills to Tarpon Springs; the Botany Mills to Lake Wales and the Minute Maid frozen orange juice concentrate plant to Plymouth, among others. He also disclosed that the company is now working with a number of other manufacturers who will probably announce plans to establish plants in Florida in the near future.

Since 1945 the company has added 68,000 kilowatts of generating capacity through the construction of additions to its three main generating plants at Bayboro, Inglis, and Enterprise, to bring the total kilowatt capacity to 181,500.

Within the next 4½ years, the company expects to add another 120,000 kilowatts at a cost of approximately 20 million dollars. Along with the new plant capacity must go huge expenditures for substations, transmission lines and many pieces of related equipment.

Mr. Gilman told the directors that work on the first 40,000 Kilowatt unit at Booth Point plant is progressing at a rapid rate and although it was originally scheduled for completion late next year, all indications point toward its completion by May, 1951.

Like all other power plants in the Florida Power system, this new unit will be tied into the transmission system of the company and will be a real help in the company's power pool which serves this fast-growing area.



A 20 TON NORTHERN OVERHEAD CRANE OPERATES ON THIS STEEL RAILWAY EXTENDING FROM WITHIN THE LINE AND SUBSTATION BUILDING TO THE FAR EDGE OF THE PAVED YARD STORAGE AREA. THIS CRANE IS AUGMENTED BY A LOUDEN MONORAIL AND 2 TON TRAVELING HOIST WHICH CONNECTS THE CRANEWAY WITH THE LOADING DOCK AND SHOP AREA, GIVING COMPLETE COVERAGE FOR A LIFT AT ANY SPOT.

New Service Center for Gulf States

Efficient Transmission and Distribution Headquarters in Beaumont, Texas Features

- **Heat Pump**
- **Materials Handling**
- **Radiant Heating**

SITUATED on a six acre site approximately two miles west of Beaumont's business district, Gulf States Utilities Company's new Service Center culminates planning which began before Pearl Harbor.

This modern development now serves as headquarters for some 300 employees who maintain the Beaumont Division electric transmission and distribution system in top-notch operating condition. Purchasing, stores and stores accounting for the company's Texas operations will also be centered at the new headquarters.

The new facilities consist of a two-story office building, one-story storehouse and service building, a two-story line and substation building, garage, paint shop, car storage shed, pole storage yard, an unloading dock 60 ft wide and 250 ft long paralleling a railroad spur, concrete paving covering an area 134 ft by 172 ft for heavy equipment storage, plus nearly 4 acres of asphalt paved yard space.

One has only to visit the new Service Center to appreciate that

MODERN RADIANT HEATING SYSTEM IN THE GARAGE OF GULF STATES UTILITIES COMPANY'S NEW SERVICE CENTER, IS SUPPLEMENTED BY A FIN TUBE HEATING RADIATION SYSTEM. HOT WATER FOR BOTH SYSTEMS IS FURNISHED BY BOILER LOCATED ON THE BALCONY OVER THE GARAGE OFFICE.

Gulf States Utilities Company has created an efficient transmission and distribution headquarters and while doing so included several refinements which combine to result in exceptionally fine and pleasant working conditions for the employees.

The buildings were designed with an aim toward low maintenance costs yet the whole layout has an eye-appeal, which is enhanced by the carefully worked-out color scheme.

Office Building

The two-story office building measures 82 ft x 138 ft and provides for the load dispatcher's office, purchasing and stores accounting, meter repair, radio laboratory, appliance repair and the stationery department on the first floor. The distribution, engineering, safety and claim departments are located on the second floor, which also accommodates a conference auditorium with stage demonstration kitchen and utility kitchen.

The main entrance of the office building is of aluminum and plate glass. Other entrances have industrial steel doors. Light is provided mainly by quick lighting fluorescent tubes installed in fixtures of the latest design. Particular emphasis was placed on the lighting of the drafting room where a system of fluorescent tubes was installed over an "egg-crate" louver which covers the entire ceiling and provides maximum illumination. Exterior areas are floodlighted.

Features common to all the new buildings include a painting scheme derived from the latest developments in the science of color dynamics; steel casements and stationary sash glazed with bluish-green heat absorbing polished plate or hammered and frosted glass; aluminum gutters, downspouts and trim together with roofing composed of built-up aluminum laid on gypsum poured over sheetrock.

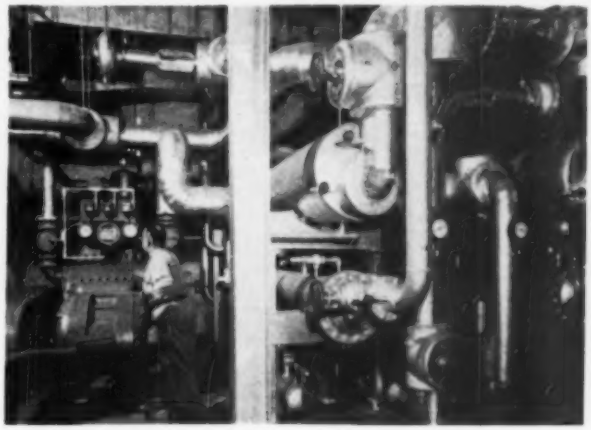
Heat Pump

Air conditioning for the office building is provided by a heat pump system of 150 ton capacity.

Operation of the heat pump is briefly described as follows: for cooling, heat from the air conditioned space is transferred through finned coils in air handling units and carried by circulating water to water chillers, where it is transferred to the freon refrigerant, thus causing the freon to change

By H. P. Davis

Senior Resident Engineer
Stone and Webster Engineering Corp.
Beaumont, Texas

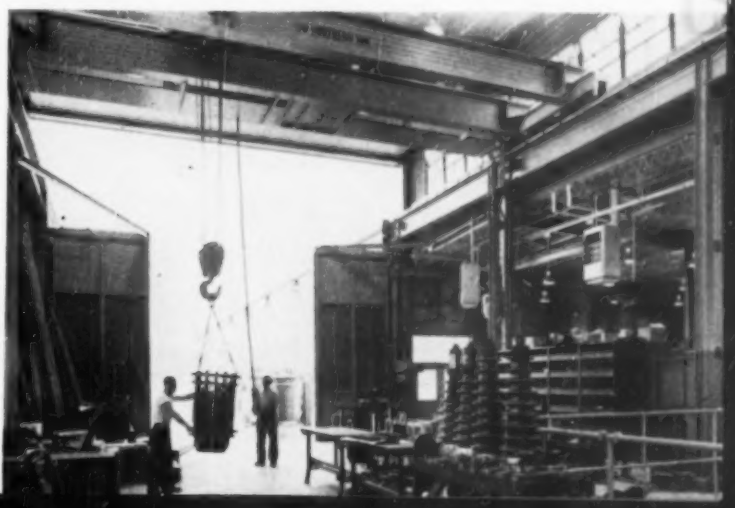


Heat Pump System

A heat pump system of 150 ton capacity is installed in the office building of Gulf States Utilities Company's new Service Center.

System is comprised of an electrically driven mechanical heat pump; principal components of which are constant temperature water wells, two 75 hp York freon compressors, condensers and water chillers, circulating water pumps, air handling units utilizing the same water coils for heating and cooling, an all sheet metal duct distribution system and automatic control instruments.

The equipment is sized to accommodate a future addition to the second floor portion of the building.



INTERIOR VIEW OF THE LINE AND SUBSTATION BUILDING. THE 20 TON NORTHERN OVERHEAD CRANE IS SUPPLEMENTED BY 2 TON TRAVELING HOIST WHICH CONNECTS THE CRANEWAY WITH THE LOADING DOCK AND THE SHOP AREA. SHOP IS COMPLETE WITH STANDARD MAINTENANCE EQUIPMENT SUCH AS DRILLS, LATHES, PLANERS, ETC.

GROUPED ACCORDING TO SIZE, TRANSFORMERS ARE HANDLED QUICKLY AND SAFELY WITH THE AID OF A MOBILE LIFT.

from liquid to gas. The suction gas is raised in temperature and pressure by the compressor. The discharged hot gas is piped to the condenser, where its acquired heat is transferred through the walls of the tubes. The temperature is thus lowered to a point where the freon changes again into the liquid state. The heat transferred in the condenser is carried away by the water pumped from the wells and is discharged finally into the sewer.

For heating, some of the heat contained in the water pumped from the wells is transferred into the freon in the chiller. The well water, having given up its heat, is then discharged into the sewer. The suction gas carries this heat to the compressor, where the freon is raised to a temperature and pressure such that the heat will flow from the hot gas to the water circulating in the condenser. The circulating pump delivers heated water from the condenser to the coils in the air handling units where useful heat is transferred to the air and distributed through the duct system to the heat space. The circulating water returns from the air handling units to the condenser to pick up more heat.

Two wells 300 ft deep, and one 500 ft well, equipped with deep well pumps, are located along the east property line. Each well is capable of delivering 100 gpm at approximately 67 F. It is expected that two wells will furnish the maximum quantity of water needed at any time and that the third will act as a standby.

In addition to the heat pump system, separate exhaust systems are provided for the toilet rooms, blueprint room, kitchen, mechanical equipment room, and the stationery room. An auxiliary air conditioning system of the conventional type is furnished for the dispatcher's office.

SUBSTATION DEPARTMENT'S TRAVELING CRANE FACILITATES LOADING OF TRANSFORMER FOR DELIVERY TO THE JOB.

Storehouse and Service Building

A structural steel frame was erected for the storehouse and service building which covers an area 138 ft x 194 ft. This structure and the office building appear as one, but they are actually two independent units separated by an expansion joint and a twelve inch tile firewall with automatic rolling

LOUDEN MONORAIL SYSTEM AND 2 TON ELECTRIC HOIST FACILITATE MAINTENANCE AND REPAIR OF SMALL TRANSFORMERS.

fire doors. A 10 ft wide concrete loading dock extends the full length of the south side of the building. A cantilevered canopy extends over the loading dock and will serve as a shelter for line trucks. Overhead steel rolling doors were installed in the exterior walls and steel industrial doors were used for the two offices. This building and the canopy are protected from fire by an automatic wet pipe sprinkler system. Heating is supplied by gas fired unit heaters whereas motor driven exhaust fans furnish ample ventilation.

Lineman's and Substation Building

The two-story portion of the lineman's and substation building is 69 ft x 69 ft while the one-story substation portion is 69 ft x 80 ft. Assembly room, locker, toilet and shower rooms are located on the second floor. Offices for the line, relay, and substation departments as well as working areas are on the first floor. Shop and storage areas are all exposed construction.

A 20 ton Northern overhead crane operates electrically on a steel railway extending from within the substation to the far edge of the paved yard storage area. This 20 ton crane is augmented by a Louden monorail and 2 ton traveling hoist which connects the craneway with the loading dock and the shop area, giving complete coverage for a lift at any spot. This makes it possible for one man to make any lift and thus speed up routine maintenance work. Shop area is complete with standard maintenance equipment, such as drills, lathes, presses, etc.

Garage

The one-story garage building is set somewhat apart from the other buildings, and it occupies a space 82 ft x 98 ft in size. Access to the washing and greasing stalls as well as entry to the hydraulic lifts in the individual repair areas is through steel overhead doors located on three sides of the building. A Louden Machinery Company monorail system and 2 ton electric hoist serve all repair, storage and supply areas. Office, supply, toilet and locker rooms are located in one corner of the building. Exhaust

POLES, BROUGHT INTO SERVICE CENTER ON FLAT CARS, ARE RACKED EASILY BY MOBILE CRANE AND ONLY TWO MEN.

fans located on the roof will take care of summer ventilation.

One of the unique features of the building is the modern radiant heating system installed in the garage floor. This is supplemented by a fin tube heating radiation system. Hot water for both methods of heating is furnished by a boiler located on the balcony over the garage office and toilets. Adequate equipment is available to completely service automotive equipment from fuel and lubrication to mechanical repairs and major overhauling.

Car Storage Shelter

An ell-shaped shelter, providing maximum accessibility for automotive equipment was erected in the extreme southeast corner of the area. This structure has a sheltered area of 7300 sq ft and contains parking stalls for 32 automobiles and 4 line trucks, as well as a storeroom. Constructed with concrete floor slab, structural steel framework, and corrugated asbestos roofing and siding, the arrangement is economical and presents an appearance which is in harmony with the architectural design of the other structures. A continuous concrete bumper rises above the floor slab and acts to prevent damage to the siding whether equipment is backed or headed into the shelter.

Paint Shop

A standard 20 ft x 60 ft quonset hut set on a 3 ft concrete wall comprises the paint shop proper. This is adjoined by an equipment room 12 ft x 21 ft in size with concrete walls and aluminum built-up roof. The quonset hut is divided with a partition, giving two rooms —a painting room 36 ft long and a drying room 24 ft long. A 10 ft x 10 ft door is provided in each end of the hut and in the partition so that automotive equipment may enter the painting room, move to the drying room, and then out of the building. Heat in the painting room is provided by a fin-tube radiation system and ventilation is provided by exhaust fans. Infrared paint drying equipment is being considered for installation at a later date.

Design and Construction

The project was designed by the architectural firm of Golemon and Rolfe and D. E. Steinman of Houston and Beaumont. Construction was accomplished under the direction of Stone & Webster Engineering Corporation.

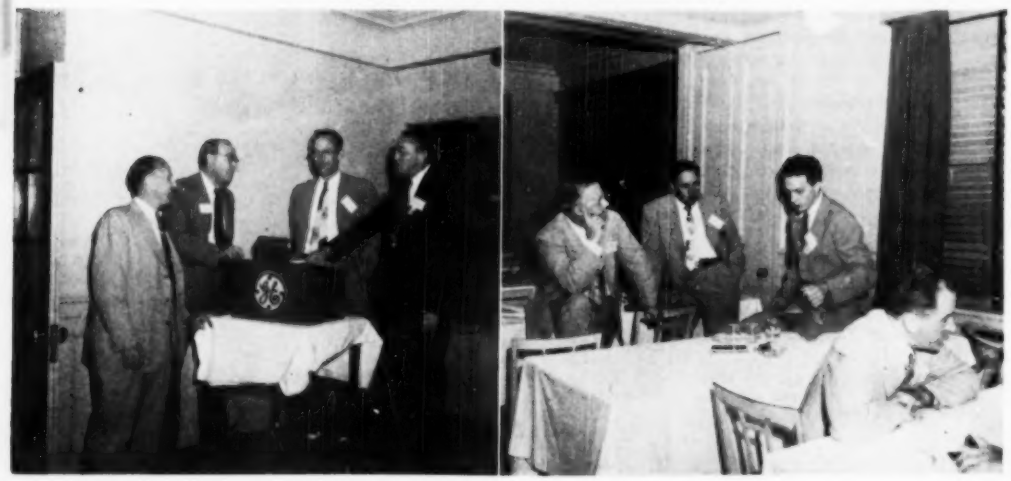
Carolinas' Industrial Future Planned at More Power to America Conference Sponsored by G.E.

THE electrical "revolution" in Carolina industry, and what can be done to accelerate it, was the topic of discussion when industrial sales personnel of six privately-owned electric utilities met recently at Charlotte, N. C. Those who participated in the review and laying of plans for the region's electrical and industrial future included top sales personnel from the electric utilities and the General Electric Company, sponsor of the Conference.

The Conference stressed electrical opportunities that will enable industry to better its competitive position in the present or normal market.

R. H. JACKSON, G. E. District Industrial Division Manager, keynoted the meeting with a discussion of "Mutual Opportunities to Serve Carolina In-

LEFT—R. H. JACKSON, G. E. CO., ATLANTA; JOHN FOX, DUKE POWER CO., CHARLOTTE, N. C.; JOHN M. ARCHER, JR., NANTAHALA POWER & LIGHT CO., FRANKLIN, N. C.; C. J. HENDON, G. E. CO., ATLANTA. RIGHT—J. V. GALLAGHER, TIDEWATER POWER CO., WILMINGTON, N. C.; CLYDE KING, TIDEWATER POWER CO., WILMINGTON, N. C.; A. J. HILL, G. E. CO., RALEIGH, N. C.



RIGHT—R. H. JACKSON, G. E. CO., ATLANTA; BILL MCGOWAN, CAROLINA POWER & LIGHT, FLORENCE, S. C.; W. P. MCPHERSON, CAROLINA POWER & LIGHT, RALEIGH, N. C.; W. C. RUTLAND, W. R. C. SMITH PUBLISHING CO., CHARLOTTE, N. C.; A. J. HILL, G. E. CO., RALEIGH, N. C.

dustry." The viewpoint of the Utilities was given in a response by JOHN M. ARCHER, JR., President, Nantahala Power Company.

Panel discussions during the balance of the morning included industrial power distribution systems, power drives and industrial controls, led by S. R. RIVES, H. B. TOMLIN, and L. W. JOHNSON, General Electric specialists on these subjects.

At luncheon, JOHN F. WATLINGTON, JR., Senior Vice-President, Wachovia Bank & Trust Company, spoke on "The Carolinas and Their Industrial Future."

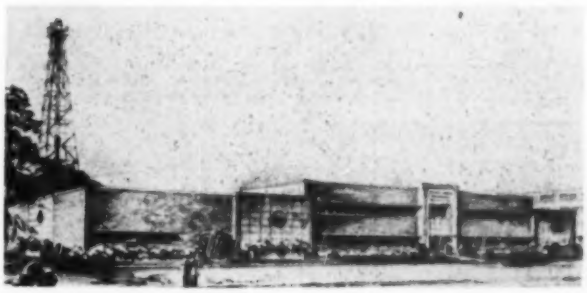
The afternoon sessions heard presentations by P. W. THOMPSON, specialist on industrial electric heating, and CARL KNAPP, industrial lighting engineer.

T. M. GEORGE, JR., G. E. District Advertising & Sales Promotion Manager, discussed advertising and sales promotion in a "salesmen's market", followed by presentation of General Electric's "More Power to America" program "Textiles Unlimited," by J. D. WALLACE, G. E. industrial sales engineer.

A new General Electric "More Power to America" program, dealing with the lighting of recreational areas for greater utilization of existing and planned new facilities was presented. This program featured a 20-minute motion picture prepared for G. E. by March of Time.

"Working Together" on mutual problems of electrical manufacturers, electric utilities, and their customers, was the summary subject discussed by H. M. PACE, Vice-President, South Carolina Electric & Gas Co.

A social hour concluded the day's Conference. The entire program was held in the Hotel Charlotte.



Hughes Tool Company to Construct $2 Million Laboratory in Houston

Plans have been completed for the erection of the new $2,000,000 Hughes Tool Company Engineering Laboratories in Houston, according to **Fred W. Ayers**, Senior Vice-President and General Manager of **Hughes Tool Company.**

The building, covering 75,000 sq ft, will have in the two-story center structure, in addition to a basement, the metallographic laboratory and offices on the first floor, while the second will house the chemical laboratory, emission spectrum laboratory, projection room and library.

The east wing of the building will be occupied by the welding laboratory. In the north bays will be the laboratory machine shop, while the west bays will be occupied by the mechanical testing section. In the latter, all kinds of unconventional tests with drill stem connections and rock bits are conducted.

The Hughes Tool Company Engineering Laboratories are a division of the metallurgical department, which is one of the three engineering departments under **Daniel J. Martin**, Vice-President-Engineering, and includes the research engineering, product engineering and metallurgical engineering departments.

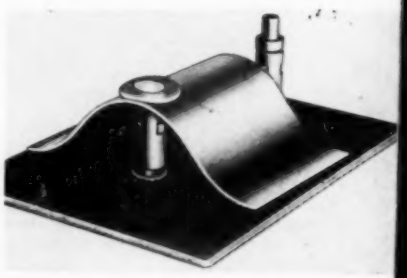
The new laboratory building is scheduled to be completed by June, 1951. Consulting engineers will be Lockwood and Andrews, while construction will be done by Southwestern Construction Company.

Stud Welding Speeds Installation

Corrugated aluminum sheet was applied at rate of 3000 to 6000 sq ft per day by 7 man crew. 18,000 squares were required to house Aluminum Company's Point Comfort, Texas, Works. (Plant described in S.P.I., July '50).

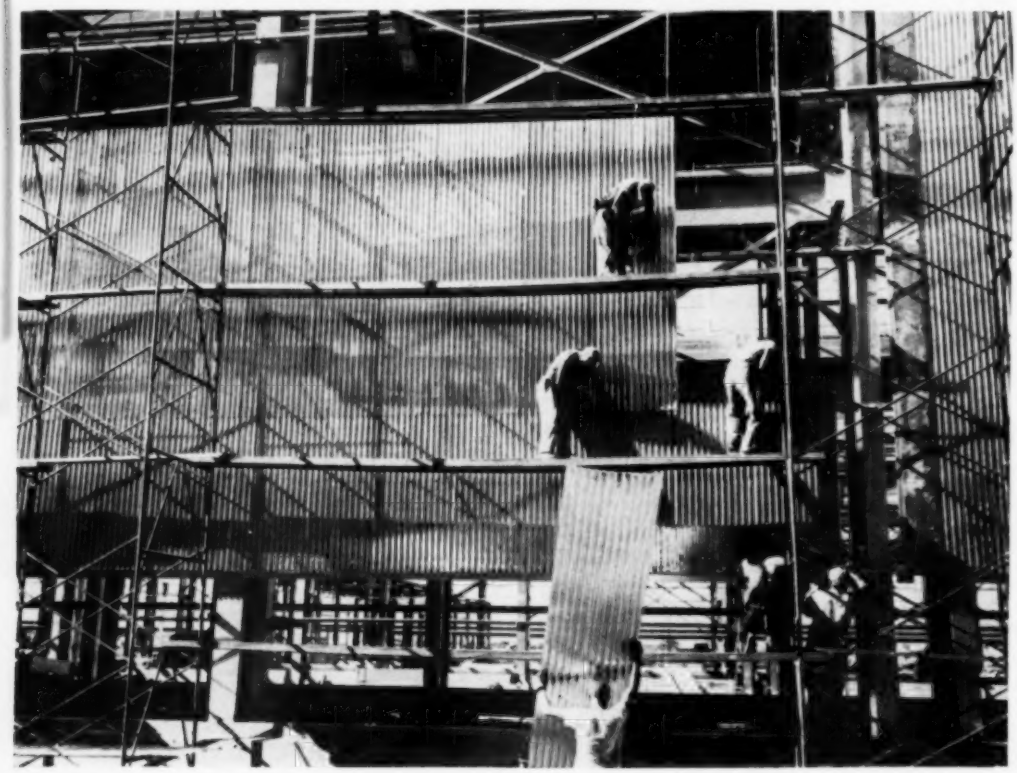
STUD welding, the high-speed, war-born technique which saved shipbuilders an estimated 100 million manhours in six years, has enabled the contractor responsible for installing the 18,000 squares of corrugated aluminum roofing and siding at Aluminum Company of America's new Point Comfort Works to break all records on this job.

H. W. (Hank) Wilson of Jamar-Olman Company, Chicago, turned his stud welding crews loose on



THE NELSON COMPOSITE ALUMINUM RIVWELD STUD USED AT ALCOA'S NEW POINT COMFORT WORKS HAS A STEEL WELDING BASE AND AN ALUMINUM RIVET EXTENSION. THIS ALUMINUM EXTENSION IS DRAWN THROUGH THE SHEET WITH A HARD RUBBER-HEADED HAMMER, AFTER WHICH AN ALUMINUM BURR IS APPLIED AND THE FASTENING COMPLETED WITH A RIVET SET.

THE USE OF COMPOSITE ALUMINUM-STEEL RIVWELD STUDS HELPED CREWS WORKING ON ERECTION OF THE CORRUGATED ALUMINUM PANELS WHICH ENCLOSE THE SIDEWALLS OF ALCOA'S NEW POINT COMFORT WORKS TO HIT A STRIDE OF BETWEEN 2500 AND 4000 SQUARE FEET PER DAY.



one of the big aluminum reduction units at a time, as fast as the paint on the structural steel was dry.

One Generator per Four Welding Guns

Working from swinging scaffolds with one Lincoln 300-ampere welding generator for every four Nelson stud welding guns, they installed all of the 35,000 composite aluminum and mild steel Rivweld studs for a single building before the first sheet of corrugated material was applied. In this fashion, the stud welding quartets completed the installation of all the studs required for 500 squares of roofing in six days, while a double quartet handled the studding for 900 squares of siding in five days.

Then the sheeting crews moved in, with four men in each roofing gang working directly on the purlins and three at work on the siding, which was erected entirely from tubular steel scaffolding around the outside.

The speed with which the sidings was applied resulted in the assignment of two stud welding gangs for every sheeting crew. In this way, a 7-man team—four stud welders and three sheeters—hit a steady stride of between 2500 and 4,000 square feet of siding per day, while 8-man roofing teams—four stud welders and four sheeters—completed between 4,000 and 6,000 square feet every day.

Production Aids

"On many occasions, working under ideal conditions on a straight-away, one roofing crew installed better than 5,000 square feet, and the peak day on siding was considerably better than 4,000 square feet," Mr. Wilson said. Careful planning and the size of the project, plus the development of a number of special aids which speeded up the laying out and installation of studs, played an important part in the attainment of these records, according to Mr. Wilson.

"In the first place, we used special templates, 20 to 24 feet in length, which were clamped to the steel struts to speed the layout work," he said. "We found that since the variation in the corrugated sheets (10 feet high by 33 inches wide) never exceeded ⅛-in., we could install all the studs before applying any sheeting with perfect safety."

The operation of four stud welding guns from a single welding generator was accomplished with leads of 00 cable, which were held to less than 250 feet. While the simultaneous operation of any two or more guns at exactly the same instant would obviously result in an incomplete weld, experience showed that this never happened more than once or twice a day, so that the loss of time and materials was negligible compared to the savings on equipment.

"By having 50 per cent more stud welding equipment available than was required for actual operation," Wilson explained, "the job was carried through without any delays or time loss for equipment maintenance."

AFTER CORRUGATED ALUMINUM SHEET IS POSITIONED OVER STUDS, THE STUD EXTENSIONS ARE DRAWN THROUGH THE SHEET, ALUMINUM BURRS ARE APPLIED, AND A RIVET SET AND HAMMER ARE USED TO COMPLETE THE INSTALLATION.

SHEET METAL SCREWS FASTEN SHEETS TOGETHER AT THE SIDE LAPS.

ALL OF THE 35,000 COMPOSITE ALUMINUM AND MILD STEEL RIVWELD STUDS REQUIRED TO FASTEN THE ROOFING AND SIDING MATERIAL FOR EACH OF THE NEW REDUCTION BUILDINGS WERE INSTALLED WITH THE LIGHTWEIGHT NELSON STUD WELDING GUN BEFORE ALUMINUM SHEET WAS ERECTED. THIS OPERATOR IS JUST PLACING THE PORCELAIN FERRULE OVER THE STUD, PREPARATORY TO THE WELDING OPERATION, WHICH SERVES TO CONFINE THE ELECTRIC ARC AND SECURE UNIFORM WELDS. A STUD CAN BE SEEN ALREADY IN PLACE ON THE STEEL GIRT, EXTREME RIGHT.

Instrumentation for the Plant Engineer

Measurement and Control of

By E. A. Murphy

Brown Instruments Division, Minneapolis-Honeywell Regulator Co.

To assist the plant or production engineer in working out his process control problems, SP&I is presenting a series of articles dealing with instrumentation. These articles will be rather basic in nature, will deal with variables commonly encountered in the plant, and will attempt to outline the principal means available for measurement and control. Advantages and limitations of different measuring systems will be discussed, as well as various installation and maintenance factors which should be considered.

INDUSTRIAL instrumentation and automatic control has progressed to the stage where there are now available instruments and complete systems capable of performing functions ranging from the simple task of controlling the temperature of a steam heated kettle, to the seemingly impossible one of accurately determining the quantity of an element present in a substance when that element is present in quantiies as low as a few ten-thousands of a per cent.

This remarkable advance in instrumentation has made it possible to conduct on a mass production basis, many processes which would otherwise have remained in the laboratory class. Naturally, advances in instrumentation have inspired development of an instrument manufacturers' language filled with highly specialized terms capable of thoroughly confusing anyone unfamiliar with the industry.

Furthermore, for any single variable such as temperature or flow, there are usually a variety of measuring and controlling instruments available, and occasionally, an instrument will be condemned as unsatisfactory on a given application, when the fault actually lies in selection of the wrong instrument or control for the application.

Economics

In other cases, lack of understanding of the basic principles of instrumentation and control will cause a production engineer to reject automatic control for a process on the basis of high initial cost, when actually it would have been possible for him to achieve the desired results by installing a less complex and consequently a less expensive controller.

It is economically inadvisable to pay for and obtain an accuracy of plus or minus 1/5 of one per cent of scale range in an instrument, when a process can be adequately controlled by one having an accuracy in the neighborhood of plus or minus one per cent of scale range. Neither is it good business to employ proportional-plus-reset control on an application where straight on-off control would be sufficient.

Services

Most manufacturers of industrial instruments maintain staffs of engineers specially trained in the application of instruments to the solution of industrial processing problems. When faced with a process control problem, the production engineer can save much valuable time and at the same time be sure that he has the right instrument for the job, if he will utilize the services of these specialists. It is generally true that the most satisfactory instrument installations are the result of close cooperation between the production engineer with his thorough knowledge of process conditions, and the instrument engineer with his special training in the capabilities and limitations of various types of measuring and control instruments.

Knowledge of Basic Fundamentals Helpful

Even though full advantage is taken of the services of instrument engineers, a knowledge of the basic fundamentals of industrial instrumentation and control is very helpful to the production engineer, not only from the standpoint of intelligently discussing proposed measuring or control systems with an instrument specialist, but also from the standpoints of proper installation and maintenance of the instruments selected.

In the field of temperature measurement alone, for example, the prospective instrument user must make his selection from the following wide variety of available methods:

1. "Blind" or non-indicating controllers.
2. Pressure-type thermometers, in which the temperature-sensitive element and the spiral or helical actuating element are integral parts of a complete thermal system and cannot be separated in the field, and which are available with gas, vapor, or mercury actuation.
3. Electrical temperature meas-

Process Variables - Part 1

Pressure Type Thermometers

This first article of the series covers basic operating principles of and factors to be considered in selection of pressure-type thermometers. Gas filled, vapor pressure, and mercury actuated types are discussed. Chief advantage of a pressure-type thermometer is its relatively low initial cost, as it is the least expensive method of obtaining indication and/or record of temperature combined with easily adjustable automatic control. However, if this advantage is realized, the instrument must be properly applied.

uring systems, in which the temperature-sensitive elements are entirely separate from the measuring system, and connected to it by electrical conductors.

This latter class is further subdivided into:

a. millivoltmeter pyrometers
b. resistance thermometers
c. mechanical potentiometer pyrometers
d. electronic potentiometer pyrometers
e. radiation pyrometers

With a few exceptions, all of these instruments are available as indicators or recorders; as indicating or recording controllers with pneumatic or electric control of the on-off, proportional, or proportional-plus-reset type, and if of the latter type, with or without rate response.

Even an attempt to describe briefly the number of temperature measuring and control systems necessitates the use of terms such as "actuating spiral", "proportional-plus-reset control", and "rate response", words which in themselves have little or no meaning to a person completely inexperienced in industrial instrumentation. Obviously, such a person would be seriously handicapped in discussing a process control problem with an instrument engineer, since the latter must of necessity utilize such terms in outlining a proposed control system.

As pointed out above, SOUTHERN POWER & INDUSTRY is presenting this series of articles on plant instrumentation in order to assist the plant or production engineer in working out his process control problems to afford efficiency of operation and low maintenance.

Since the majority of temperature measurement and control applications in the temperature range up to 1000 F are handled by pressure-type thermometers, a thorough understanding of the operating principles of this instrument is important. A typical thermal type pressure system is illustrated on the following page.

Pressure-type thermometers are usually identified by the type of fill employed, i.e., gas, vapor tension, or mercury. Each type has certain characteristics which should be considered before an instrument is selected for a given application.

Gas Filled Thermometers

As the name implies, the entire thermal system of this instrument is filled with a pure, dry gas, usually nitrogen, under an initial pressure of between 200 and 700 psi. The size of the bulb depends on the length of capillary tubing between the bulb and the instrument, the volume of the bulb being, in general, at least nine times the combined volumes of the capillary tubing and the actuating element. This means, of course, that applications requiring that the instruments be mounted, some distance from the points of measurement, will necessitate the use of relatively large bulbs, a factor of significance where bulb mounting space is at a premium.

Since, in the case of a pure gas, the pressure increases equally with equal increases in temperature, the chart and scale of a gas actuated thermometer are evenly graduated throughout the entire range. For this reason, the instrument lends itself to applications where the temperature being measured is likely to vary over the full range of the scale.

Gas actuated instruments can be used for measuring temperatures between approximately minus 40 F and plus 1000 F, and usually have a minimum temperature span in the neighborhood of 100 F. This means that the full scale span of the instrument must be at least 100 degrees; for example, minus 40 to plus 60 F; zero to 100 F; or 250 to 350 F.

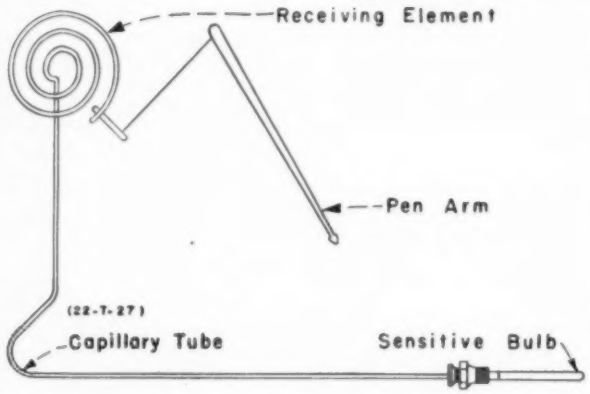
Head effect, i.e., the effect of the elevation of the bulb with reference to that of the instrument on the calibration of the instrument, need not be considered with this type of measuring system. The maximum length of capillary tubing which can be used is generally limited to about 200 ft. Above this, objectionable measuring lag may

be encountered.

When gas actuation is employed, the bulb and capillary tubing may be of copper, steel, stainless steel, Monel, nickel or practically any other metal as required to withstand existing corrosive conditions.

Vapor Pressure or Vapor Tension Thermometers

In this type of thermal system, the bulb is partially filled with some highly volatile liquid under an initial pressure which can vary between 50 and 600 psi, the remaining space being filled with the vapor of this liquid. As heat is applied to the bulb, more of the liquid vaporizes and passes into the capillary tubing and actuating spiral. Since these are at a lower temperature than the bulb under normal operating conditions, this vapor condenses and there exists a condition where the tubing and spiral are filled with some of the liquid formerly present in the bulb. As the bulb temperature increases, further vaporization takes place, creating a vapor pressure (similar to steam pressure in a boiler) which is transmitted through the liquid in the capillary tubing to the actuating spiral. Action of the spiral is the same as for the gas actuated system just described.



Pressure Type Thermal System

This measuring system is really a refinement of the familiar glass stem thermometer. The latter device consists of a section of glass capillary tubing (the glass stem), sealed shut at one end, and containing a temperature-sensitive bulb at the other. This bulb serves as a reservoir for some liquid, called the actuating medium. When the bulb is exposed to an increase in temperature, the actuating medium increases in volume and moves up into the glass stem. The vertical position of the actuating medium within the glass stem indicates the temperature to which the bulb is exposed.

In a pressure-type thermometer, a metal bulb replaces the glass one. This bulb is connected to a hollow receiving or actuating element (which can be either a spiral, a helix or a bourdon tube) by a length of metal capillary tubing. These three components, bulb, capillary tubing, and actuating element make up a sealed thermal system which contains the actuating medium or "fill" under pressure.

Any change in the temperature to which the bulb is exposed causes a corresponding change in the pressure set up by the actuating medium within the sealed thermal system. This pressure change is transmitted through the capillary tubing to the actuating spiral, one end of which is anchored firmly to the instrument case, while the other end is linked mechanically to a pen or pointer.

The pressure change thus produces a winding or unwinding movement of the spiral, which in turn causes movement of the instrument pen or pointer. Since, for any type of actuating medium or fill used, there is a definite increase in pressure per unit temperature rise, the instrument is calibrated directly in temperature units.

Because of the relationship between temperatures and vapor pressures, the chart and scale divisions of a vapor actuated thermometer increase according to the law of squares. This means that the spacing between the divisions increases toward the upper portion of the scale, resulting in greater pen movement for a one degree temperature change in the upper two-thirds of the instrument range, than for a similar one degree change in the lower third of the range. This characteristic makes the instrument particularly desirable for an application where the temperature to be measured or controlled is critical in the upper portion of the range.

Vapor actuated thermometers are used for measuring temperatures between approximately minus 10 F and plus 600 F, and usually have a minimum temperature span of about 100 F in the low ranges, and 65 F in the high ranges.

Head effect is a factor which must be considered. This is so because the temperature measured by this instrument is that existing at the free surface between the liquid and the vapor in the bulb, and is a function of the vapor pressure developed at this point. Once the instrument has been installed and calibrated for given bulb and instrument elevations, any change in these relative elevations will cause a change in the static head of liquid within the capillary tubing. Under normal operating conditions, i.e., with bulb temperature **above** that of the spiral and capillary, increasing the elevation of the bulb above that of the instrument will cause the instrument to read high, since the spiral will be acted upon not only by the vapor pressure, but also by the static head of liquid in the bulb and tubing. Conversely, moving the bulb below the instrument will cause a low reading.

If the bulb temperature is below that of the spiral and capillary, all of the liquid will be in the bulb and since the head of vapor is negligible, the elevation of the bulb with respect to the instrument will have no effect on the calibration. Maximum capillary length for most satisfactory operation is usually about 200 ft.

Care should be taken in using the vapor actuated thermometer on applications where conditions can cycle so that the bulb-above-temperature-of-spiral relationship will reverse. When the bulb temperature falls below that of the capillary and spiral, all of the liquid contained in the capillary must be in the bulb before the correct temperature is indicated or recorded. While this change is taking place, the instrument pen may operate rather erratically, a serious condition if the instrument is employed as a controller.

No ambient temperature compensation is required with the vapor actuated thermometer. This is true because the indicated temperature is always a function of the free surface between the liquid and vapor and since this surface is normally in the bulb, changes in temperature along the capillary tubing have no effect. Bulb and tubing may be of copper, steel, Monel or other metals.

Mercury Actuated Thermometers

A mercury actuated thermal system is first evacuated, and then completely filled with mercury at an initial pressure of between 400 and 1000 psi. Small bulbs are generally used, the size of the bulb decreasing as the temperature span increases. A bulb for an instrument having a temperature span of 100 F, for example, may contain 108 cc of mercury, while one intended for use over a span of 400 F may contain only around 3 cc.

Since the entire thermal system —bulb, capillary tubing, and actuating spiral—is filled initially with mercury under pressure, and since the spiral contains a very small amount of mercury, a high speed of response is obtained. This is true, obviously, because an increase in the volume of the mercury in the bulb, is transmitted directly to the spiral. There is no need for a volume of liquid to be transferred from the bulb to the spiral.

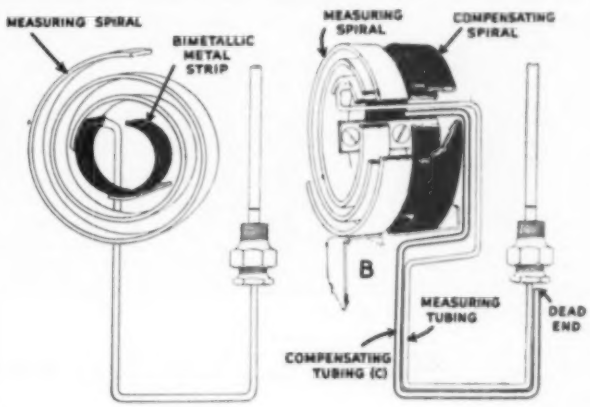
The mercury actuated thermometer, like the gas filled one, utilizes an evenly divided chart and scale throughout its entire range. These thermometers are used for measuring temperatures between approximately minus 40 F and plus 1200 F, and have a minimum temperature span of about 75 F.

Head effect is also a factor with the mercury actuated system, since any change in the elevation of the bulb with respect to the spiral must of necessity cause a change in the static head of mercury acting against the spiral. For best instrument operation, capillary tubing length should not exceed 200 ft.

Because of the action of mercury on metals, bulbs, capillary tubing, and actuating spirals for mercury actuated thermometers are usually supplied only in stainless steel material.

The necessary system of ambient temperature compensation for both gas filled and mercury actuated thermometers is explained in an accompanying illustration and caption.

In order to visualize the operation of the capillary compensating system in the mercury actuated thermometer, consider the effect of a sudden increase in temperature at some point in the capillary tubing between the bulb and the instrument. The mercury in the measuring system capillary will increase in volume and consequently exert added force upon the measuring spiral which will attempt to move the instrument pen



Compensating for Ambient Temperature Changes

Since the gas present in the spiral, as well as that in the bulb is sensitive to temperature changes, a means of compensating for ambient temperature changes, i.e. changes in temperature within the instrument case, must be provided.

As illustrated in the **gas filled thermometer** at the left, this is usually accomplished by mounting a bimetallic strip in the instrument case. One end of the strip is anchored and the other fastened to the actuating spiral in such a manner that expansion or contraction of the strip offsets any movement of the spiral caused by the action of the temperature on the gas within it.

In **mercury actuated thermometers** the case compensation is sufficient where relatively short lengths of capillary tubing are used and where there are no wide fluctuations in tubing temperature.

However, if long lengths are used and widely fluctuating temperatures are present, the instrument requires **both case and capillary compensation.** The latter is accomplished in the illustration at the right, by adding to the thermal system a second spiral and length of capillary tubing. The second spiral is mounted in the case so that it unwinds in a direction opposite to that of the measuring spiral, and the compensating tubing is run alongside the tubing connecting the bulb to the measuring spiral, but is dead-ended at the bulb.

No ambient temperature compensation is required with the **vapor actuated thermometer.** The indicated temperaure is always a function of the free surface between the liquid and vapor and since this surface is normally in the bulb, changes in temperature along the capillary tubing have no effect.

or pointer upscale. The same temperature increase that acted on the measuring system capillary, however, also acts upon the compensating capillary which is mounted alongside it. The increase in volume of the mercury in this tubing will exert force upon the compensating spiral, and since the action of this spiral opposes that of the measuring spiral, the two opposing forces cancel out, and consequently no pen or pointer movement results.

Advantages and Limitations

The chief advantage of a pressure-type thermometer is its relatively low initial cost, as it is the least expensive method of obtaining indication and/or record of temperature combined with easily adjustable automatic control.

If this advantage is to be fully realized, however, it is important that the instrument be properly applied.

Since the cost of a pressure-type thermometer increases as the distance between the bulb and the instrument increases (due, of course, to the cost of the armored capillary tubing), the indicator or recorder should be mounted as close as possible to the point of measurement.

That type of actuation, i.e., gas, vapor, or mercury, which will best suit the requirements of a given application should be selected. A vapor actuated instrument, for example, is ideally suited to an application where the measured temperature is critical at a point in the upper two-thirds of the range selected. Vapor actuation will perform very poorly where the temperature of the bulb cycles above and below that of the capillary tubing and actuating spiral.

The distance between the bulb and the instrument exerts an influence not only on initial cost, but also on other important factors. Speed of response, for example, is directly affected. The longer the capillary tubing, the greater the mass of actuating medium which must be moved, and the greater the effect of friction on this medium. Excessive lengths of tubing cause marked measuring lag, i.e., lag between the time at which the bulb senses a change in temperature, and the time when this change is reflected on the instrument scale or chart.

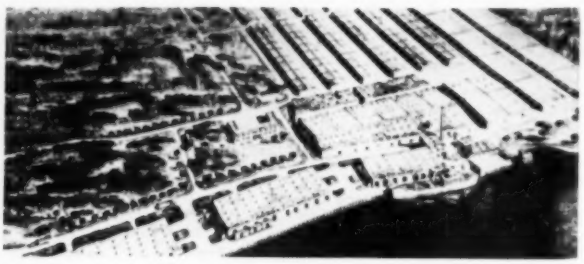
Long lengths of tubing also complicate the problem of protecting this tubing from mechanical damage. This is a matter of considerable importance since a broken capillary results in the thermal system losing all or part of its fill. An accident of this type is serious, because the entire thermal system must be replaced, an operation which renders the instrument inoperative for quite some time.

The pressure-type thermometer is limited in its ability to provide multiple temperature measurement, i.e., a record of several temperatures on one chart. Although two- and three-pen thermometers are quite common, each temperature measured requires the use of a complete thermal system, and the physical size of the instrument case limits the number of pens and actuating spirals than can be employed in a single instrument.

Replacement of the entire thermal system is mandatory in the event of damage to the bulb or capillary which causes loss of all or part of the actuating medium. Unless spare thermal systems are kept on hand, this will result in the instrument being out of service for the time required to send the damaged system back to the manufacturer for repairs. This handling is necessary in most cases, since few plants have instrument departments which are equipped to fill and seal thermal systems under pressure.

In summation, a pressure type thermometer will be economically desirable for an application, if the following conditions exist:

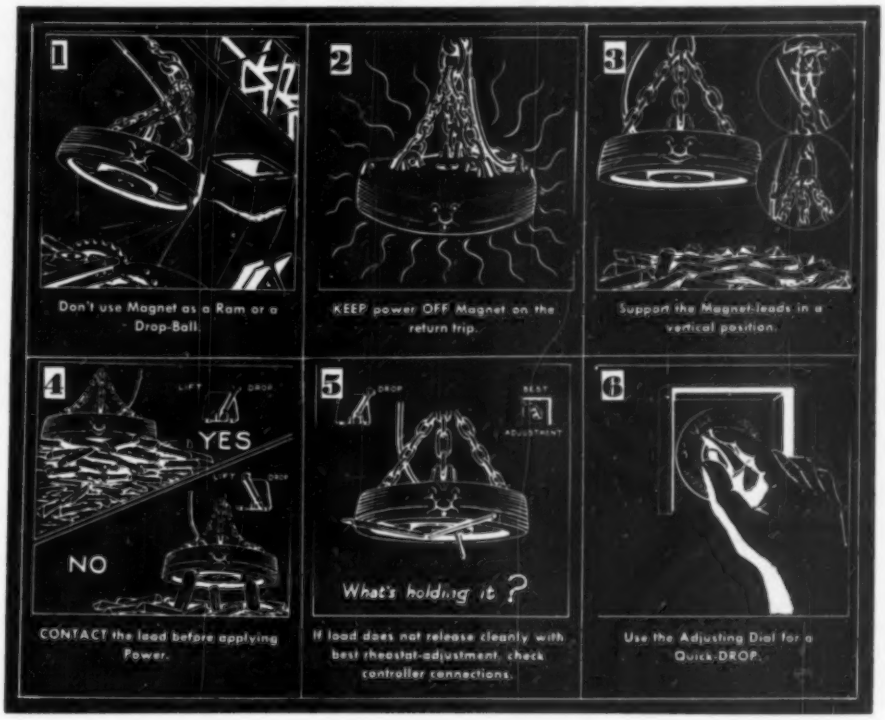
1. Instrument located fairly close to point of measurement.
2. Multiple temperature recording not required.
3. Temperature to be measured falls within the operating range of the instrument selected.
4. Response speed of instrument adequate for process conditions. (This is of particular importance when the instrument is a controller, and the process is continuous.)
5. Correct actuation (gas, vapor, or mercury) selected for existing process conditions.
6. Capillary tubing can be mounted where it will not be damaged.



Proposed Port Facilities — Savannah, Ga.

Featuring berthing facilities for four of the largest cargo vessels, large transit sheds and modern loading and handling equipment, this artist's conception shows initial improvements proposed by the Georgia Ports Authority for improvement of the **State Port at Savannah, Ga.** Present plans call for an initial expenditure of $4,500,000. **Robert and Company Associates, Inc.,** Architects & Engineers.

Part 2 of Measurement and Control of Process Variables, to be published in the November issue of SP&I will discuss thermocouples, probably the most widely used of the various electrical temperature sensing elements.


1
Don't use Magnet as a Ram or a Drop-Ball.
2
KEEP power OFF Magnet on the return trip.
3
Support the Magnet-leads in a vertical position.
4
YES
NO
CONTACT the load before applying Power.
5
What's holding it ?
If load does not release cleanly with best rheostat-adjustment, check controller connections.
6
Use the Adjusting Dial for a Quick-DROP.

Preventive Maintenance for Lifting Magnets

LIFTING magnets are truly the whipping boys of the metal handling trade since there is hardly a piece of equipment that receives more rugged wear unless it be the skull cracker, the companion slave of the magnet. While it is admitted that a magnet must be built to "take it" it should not be considered advisable to heap extraordinary abuse on it because of its sturdy construction.

No. 1 in the list of abuses one may see all too frequently is the act of using the magnet as "skull cracker."

No. 2 is failure to cut off power on the empty return trip, which permits the magnet no cooling off period and is thus destructive to the insulation.

No. 3, support the magnet leads in a vertical position so that no slack lies on the magnet thus permitting falling metal to strike and crush through the vulnerable insulation. Keep the power lines snug to the hoisting cable.

No. 4, suggests that the magnet be allowed to settle down on the metal before applying power. This permits more intimate contact between magnet and metal and as the current is applied the magnetization is thus more completely saturated through the mass and insures bigger pay loads.

No. 5, indicates the use of an adjusting dial for a quick drop. Reverse current is applied as the holding power is cut off thus insuring a quick clean deposition of the metal without danger of "stragglers".

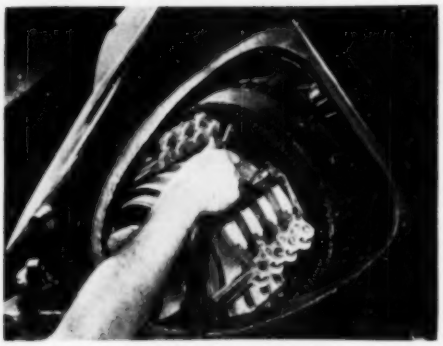
No. 6, suggests the need for a check-up when metal continues to cling after discharge. This may mean that the controller has an "open" resistance or loose and dirty connections.

PAUL C. ZIEMKE (OAK RIDGE)

Cleaning and Varnish Treating Electrical Machines in Repair Work

By D. L. Gibson

Benolite Department
Westinghouse Electric Corporation
Manor, Pennsylvania



REMOVING LOOSE DIRT FROM ROTOR WINDINGS WITH COMPRESSED AIR.

Money, time, and labor can be saved by proper choice of materials and methods for the cleaning and varnish treatment.

PROPER selection of varnishes and correct application during repair, may improve the performance of the apparatus in service. Improved resistance to oils, moisture, and dirt adherence can be obtained if the correct varnish is used and properly applied. Basic classes of varnishes are available commercially for treating electrical machines. It is important to thoroughly clean all surfaces which are to be varnish treated in order to secure good adhesion of the varnish film. The best varnishes available will give little protection if applied to dirty or oily surfaces to which they cannot adhere.

Machines in the shop for insulation repair or rehabilitation may be divided into several classes:

1. Equipment to be cleaned and given varnish treatment only.
2. Machines which are to have single coil repairs, throws of coils replaced, or insulation replaced.
3. Equipment which is to have all coils removed, completely rewound, and re-insulated.
4. Machines requiring special treatment due to exposure to chemical fumes, salt water, or flood waters.

CLEANING GREASE, OIL AND DIRT PARTICLES FROM A SLOTTED ROTOR WITH SOLVENT.

Cleaning

Cleaning of apparatus and insulation goes beyond simply wiping off the surface with solvent, or removing old coils and scraping the slots free of varnish. Machines that are being rehabilitated by means of a varnish treatment require cleaning that will remove grease, dirt and carbon dust without damaging the insulation. For stators or rotors which are to have the coils removed and rewound, a method can be used that not only eliminates dirt and grease, but also softens the varnish film to facilitate removal of coils, cleaning of vent ducts, and of frames. Proper cleaning of laminations and core slots can be achieved by still another method. In some cases, machines may require special cleaning with water or solvents due to exposure to chemical fumes, salt water, or flood waters.

Standard methods of cleaning insulation include: wiping the parts with lintless cloths soaked

with solvent; blowing the dirt out with air pressure; drawing the dirt off with vacuum cleaning apparatus; spraying or immersing in solvents; and washing with water. Specialized methods include the use of vapor degreasing and the use of the steam "jenny."

This discussion applies to machines that may be dismantled to be cleaned and varnish treated, or machines that can be taken to repair shops for overhauling. The following suggestions do not apply to high voltage machines of 4,000 volts and over. These require special cleaning processes with mild solvents.

Blowing Out and Drawing Off Dirt

Blowing out dirt with air at about 40 to 50 pounds pressure is usually effective, particularly in inaccessible places. However, the use of air merely removes the loose dirt, and does not disturb the embedded material. Cleaning can be done quickly with compressed air, but the air should be dry and clean and the windings should not receive the full force of the air pressure. Equipment to be cleaned should be given a preliminary cleaning with air pressure to remove the loose dirt. Care should be exercised in using air, however, to prevent blowing dirt into cracks in the insulation. If vacuum cleaning equipment is available, it should be used.

Use of Solvents

When the accumulation of dirt on the frame and insulation contains oil and grease, an organic solvent will be required to remove it. Solvents for oil and grease can be applied by wiping with lintless cloths moistened with the cleaning fluid. Obviously, this method cleans only the readily accessible areas. Pressure spraying, or immersing the parts in a bath of the solvent, will reach the inaccessible regions. The immersion method entails some hazard in the maintenance of the tanks of solvent. However, small motors can easily be cleaned by hanging on racks and dipping in solvents.

These methods adequately clean the surface of the machine for repairs, or of the insulation for additional varnish treatment or for removal of a few coils. They do not clean out vent ducts, dissolve varnish, loosen coils in the slots, or clean slot laminations. The baked varnish film is rarely injured.

In general there are three types of organic solvents in use for cleaning:

1. Petroleum distillates of low solvency strength, Kauri-butanol value), such as mineral spirits, or a high flash point dry cleaning solvent known as Stoddard's Solvent, or Cleaner's Naptha.
2. Petroleum distillates of medium solvency strength such as naphthenic mineral spirits.
3. Carbon Tetrachloride.

Typical analyses of several petroleum solvents are given in Table I. Solvents are purchased to such specifications. Those for cleaning purposes should have flash points of approximately 100 F or greater and a solvency strength (kauri-butanol value) in the range of 30-45. Such solvents are inexpensive and they evaporate leaving little or no residue. It should be remembered that high flash point solvents minimize the fire hazard, but they are nevertheless inflammable. The necessary precautions should be taken in providing facilities for storing flammable liquids. Insurance regulations usually provide adequate instructions for the storage of solvents.

Petroleum solvents are the least toxic of these cleaning agents, but ample ventilation should be furnished. Carbon tetrachloride is non-inflammable, but extremely toxic, and of very high solvency strength. It should be used only when a very severe dirt condition is encountered, and then only with special health precautions. In some cases carbon tetrachloride is mixed with petroleum solvents to increase their cleaning effect, and decrease the fire hazard. A mixture of 50 per cent carbon tetrachloride and 50 per cent mineral spirits is non-inflammable, but the vapors mixed with the right proportions of air are explosive. In no case should alcohols, benzol, or toluol be used. They are very strong, will dissolve or soften the varnish present, are extremely toxic, and are fire hazards. Petroleum distillates of low solvency strength will not attack the baked varnish films present, but will dissolve oil and grease and loosen dirt. Some air drying varnish films will be softened by petroleum solvents. Synthetic varnishes will stand more severe cleaning methods than asphalt varnishes. Low strength solvents should be used on asphalt base varnishes.

Vapor Degreasing Method

For a number of years the metal finishing or process shops have utilized vapor degreasing tanks for cleaning surfaces prior to further handling or finishing with enamel or paint. This method utilizes the principle of condensing hot solvent vapors on the metal to be cleaned, which washes off the grease and dirt. The washing solvent is always clean, since it con-

EXAMPLES OF PROPERLY AND IMPROPERLY VARNISHED RAILWAY ROTORS, AFTER ROTATION. NOTE VARNISH RUN-OUTS POORLY PROCESSED ON ARMATURE AT LEFT.

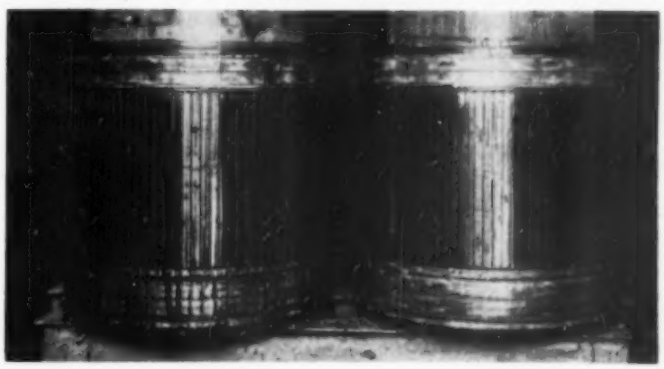


TABLE I—Specifications for Standard Petroleum Solvents

Values	Xylene Substitute	Mineral Spirits	Napthenic Mineral Spirits	High Flash Mineral Spirits
Sp. gr. at 15.5° C.	0.77–0.80	0.76–0.79	0.81–0.82	0.77–0.79
Pounds/gallon	6.4 –6.7	6.3 –6.6	6.7 –6.8	6.4 –6.6
A.S.T.M. Distillation, Degrees F				
Initial B. P.	290	305	310	325
50 per cent over	305	345	340	350
90 per cent over	315	370	370	370
Dry point	325	395	395	395
Kauri-Butanol Value	36–47	31–40	42–46	34–36
Flash Point ° F	85	103	105	115

TABLE II

Classification of Solvent Varnishes as Resin Base

I. Phenolic (synthetic)
a. unmodified
b. oil modified

II. Alkyd (synthetic)
a. unsaturated (maleic anhydride resins)
b. oxidizing alkyd, oil modified
c. alkyd-phenolic
d. natural resin modified alkyds

III. Oleoresinous (natural resins)
a. asphalts with drying oil
b. natural resins with drying oil
c. ester gums with drying oil
d. modified natural resins with drying oil

IV. Silicone resins

denses on the surface from a vapor. Solvents used are high boiling, toxic, non-inflammable, chlorinated compounds called trichlorethylene and perchlorethylene. Sold under various trade names, these compounds are similar to carbon tetrachloride. This combination gives a solvent which attacks or dissolves greases, oil, dirt, enamels and varnish films, and many organic chemicals. However, these solvents have no dissolving effect on shellac and some organic enamel finishes. Trichlorethylene boils at 188 F, while perchlorethylene boils at 250 F.

Such principles can be adapted to clean wound cores or other equipment in which all the coils are to be removed, or equipment which is to be rewound, and vents and metal thoroughly cleaned. The hot vapors condensing on the equipment attack the dirt, grease, and varnish film. The solvent softens and dissolves the varnish around the coils so that stripping is accomplished easily, and laminations are not damaged by coil removal. If slots and laminations are to be further cleaned, the core may be returned after stripping for another cleaning cycle. This method is not to be recommended where only the insulation surface is to be cleaned and the wound core given a coat of varnish and baked.

The degreasing process is performed in a tank, heated by steam or gas, and provided with cooling coils on the inner walls. There are patented degreasing chambers available which are manufactured and installed by companies specializing in this method. In this operation, the cleaning solvent is brought to vaporization or boiling point. The vapor rises to the condensing coils, located near the top of the chamber. The apparatus to be cleaned is then lowered below the vapor line into the vapor, which condenses immediately in a steady stream on the piece. When the equipment being cleaned reaches the temperature of the vapor, condensation stops and the cleaning process is completed.

Cleaning by Immersion in Water

Electrical apparatus which has been in flood waters and is clogged with silt and mud usually can be cleaned by immersion in water. Some chemicals to which modern electrical machinery is exposed are soluble in water, and become embedded in grease as a hygroscopic slime. These can best be cleaned by immersing the dismantled parts in running water at 125-135 F, scrubbing the metal with brushes, and wiping the insulation with lintless rags.

With any process in which water is used on electrical windings care must be taken to dry out the equipment slowly to prevent damaging the insulation by the formation of steam.

There are three methods of drying winding insulation:

1. Internal Heat
2. External Heat
3. Combination of Internal and External Heat

Shops in which electrical machinery is maintained and repaired should have a forced draft ventilated oven capable of reaching 275 F to be used for the baking of varnish and the drying of machinery after cleaning with solvents or water. When water has been used for cleaning it is preferable to dry the windings in an oven. Regardless of the heating method used, it is recommended that the first bake be limited to a maximum of 167 F on the windings, and that the temperature be slowly raised to 230 F maximum for Class A windings and to 266 F maximum for Class B windings. Frequent insulation resistance measurements should be made and curves plotted for future reference in order to standardize bakes for certain classes and types of machines. The drying time necessary is controlled by the size of the machine and the heating methods used, as well as the condition of the windings.

Cleaning Cores

Cores can be further cleaned after the coils have been removed by use of a blast of fine sand. Slots can be cleaned in this manner preparatory to rewinding. However, the operation has to be controlled carefully in order not to burr laminations, or remove steel from the punchings. There is some question as to the effect on core losses, but this method is being used on certain types of cores with repeated success.

It is not advocated that facilities for such a diversity of methods be maintained. However, apparatus to be cleaned should be examined thoroughly and the proper techniques employed to remove the contamination present. It may be that the majority of equipment to be cleaned falls within a certain

category, and that a suitable method can be adopted to speed the process.

Insulating Varnishes

In general, there are many types of varnishes available for the treatment of electrical equipment. It is not advocated that any great number of these varnishes be stocked, but rather that certain basic types be kept available. As discussed previously, machines may fall into certain groups according to the repairers or rehabilitation needed. Wound equipment brought to the shop for repair to part of the insulation, or for replacement of a throw of pre-insulated coils, may well be given two coats of an air dry varnish, particularly if the equipment is to be used indoors in a dry place. However, motors used in outdoor locations, in for a complete rewind, may well need two or three coats of a thermosetting baking varnish.

Proper choice of varnish for treating electrical equipment depends upon the ultimate use of the apparatus. No single varnish is suitable for all applications.

For practical application, varnish may be classified according to the following:

1. Air drying or baking type
2. Speed of cure or air dry
3. Temperature of bake (if baking type)
4. Hardness of film deposited
5. Thickness of film deposited
6. Tank stability of varnish
7. Adhesion of film to metal or insulation
8. Moisture-proofness of film
9. Heat stability of film
10. Oil-proofness—in certain applications
11. Type of thinner
12. Cost

Varnishes in general use for electrical insulation may, in addition, be classified according to the base resin and the type of film produced. Solvent type varnishes can be grouped generally into phenolic, alkyd, or oleoresinous. Various general subdivisions of each are listed in Table 2. To these may be added newer materials, such as solventless varnishes and silicone resins (the latter being best adapted for high temperature insulation).

TABLE III—Classification of Film Characteristics of Standard Varnishes

	Degree of Hardness	Moisture Proofness	Heat Stability
Unmodified phenolic	1	2	4
Oil-modified phenolic	2	1	3
Modified alkyd	3	1	1
Oxidizing type alkyd (oil modified)	4	2	1
Oleoresinous, oil modified	2	3	3
Asphalt (oil modified)	5	4	5
Phenolic alkyd	2	1	2

Note—The lower the value, the harder, more heat stable and more moisture resistant the film.

An additional classification has been made of the standard baking varnishes according to the hardness of the film formed, heat stability and moisture proofness of the film (see Table 3). It should be noted that any of the above varnish base resins can be made into an air dry varnish.

During the last ten years, many newer types of electrical insulating varnishes have been developed and are in commercial or semi-commercial use. Solventless varnishes for impregnating coils to give a high percentage of internal fill may find application for treating magnet coils and railway equipment. Such varnishes are thermosetting and are relatively heat stable.

The type and application of the equipment governs the choice of varnish in which it is treated. Surface protective coatings (for example on wound machines or finished control coils), should be tough, hard films. However, surface films for large armature or stator coils should be plastic and flexible to allow manipulation of the coil during winding.

For example, the choice of the wrong varnish or improper cure may lead to serious difficulty with rotating apparatus. Requirements for varnishes applied to rotating equipment are severe. The film must have good adhesion to metal and insulating materials, good moisture proofness, form a homogeneous film, and preferably be thermosetting. If the film is difficult to cure, or is a plastic material which does not cure throughout to at least a gelatinous state, throwout of varnish will result on rotation. Throw-out produces holes and bare spots in the protective coat, giving poor moisture and dirt protection. For application on Class B rotating apparatus, it is preferable to use a modified alkyd (phenolic resin being a preferred modifier).

Small motors (particularly with high speed rotors) in which the coils are formed by winding directly from the reel of wire into the slots, require hard, rigid windings. This also applies to small motors in which the coils are formed by looping the wire onto a form and then placing the loop of flexible wires into the slot. Such machines require a varnish which bakes into a hard mass or film, giving rigidity to the windings. Here the varnish serves as a protective coating and a mechanical binder as well.

Internal voids or cross sections occurring in coils or machines should be filled with through-curing or thermosetting varnish. The use of certain air dry varnishes on creepage surfaces is to be avoided. Pigmented films apparently give better performance. This is particularly applicable to rotors of d-c machines in which there are surfaces producing low resistance paths. This difficulty is not encountered with d-c stators and many types of a-c machines (except railway). Air dry varnishes are applied here with success and find a wide use.

Class A and B

Class A insulation does not require the same type of varnish as Class B insulation. Class B apparatus requires varnish which is heat stable at 135 C and does not soften or run out at temperatures

above this point. Resins used for coils structural purposes should be hard and rigid with good adhesion. Where conditions of severe moisture or chemical fumes are encountered, pigmented finishes applied as the outside coat over multiple dips of a baking varnish are desirable.

Unmodified phenolic resins are used for the bond between armature coil straps, or mixed with an inorganic filler as a cement for adhering field coils. Such materials are satisfactory to treat the windings of small high speed rotors to insure a rigid structure with moisture proofness. However, they should not be used where the operating temperature is continuously above 120 C.

Oil-modified phenolics find a general use in the electrical industry for treating wound apparatus, relay coils, magnet coils, and radio equipment. Armature, stator and field coils can be given a dip in this type of varnish before winding. Oil-modified phenolics produce a moisture-proof, oil-resistant, moderately flexible coating. They are not nearly as heat stable as the alkyd coatings, but may be used in Class B applications. Certain types of coil-modified phenolics are thermosetting or through curing.

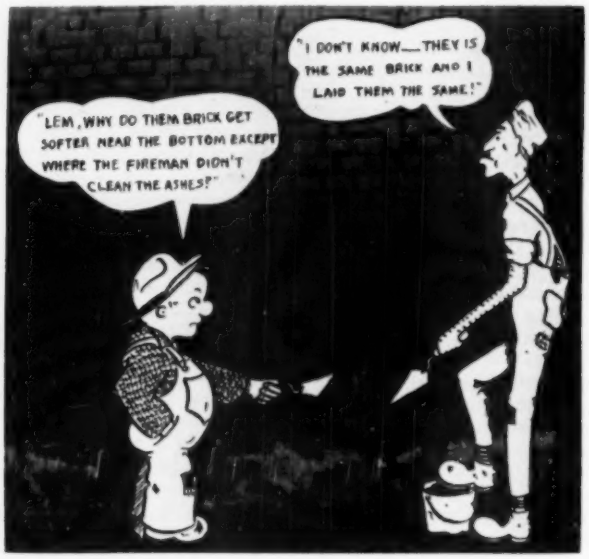
Alkyd resinous coatings are applied to give maximum protection to motors and generators and line equipment where severe moisture conditions are encountered and where improved arc resistance is required. They have found use as a baking or air dry varnish for surface coating Class B armature or field coils, to produce a flexible coil that is easy to wind even after storage. In addition, alkyd baking varnishes are used as surface coats for slower speed rotating equipment.

Phenolic modified alkyd resins are used where moderately hard, through-curing and thermosetting films are required. These materials have good arc resistance and heat stability, and excellent moisture resistance. Such applications are the filling or impregnating of deep sections in Class B equipment, railway rotors, magnet coils and field coils.

Asphalt base films find a wide use on Class A electrical equipment where moderate moisture proofness is required and operating conditions are not too severe. Such varnishes have an affinity for cotton. They protect and plasticize the fibers. In general, asphalt varnishes are not satisfactory for Class B operation where higher heat stability is required, or where better moisture resistance is necessary. Oleoresinous base varnishes (clear or black) find a wide use in the industry on Class A equipment. They have moderate moisture-proofness, and are relatively cheap in price. They have found use in applications in place of asphalts where better heat stability, oil proofness, and hardness is required.

Application of Varnish

In the application of varnish to electrical equipment, it is particu-


"I DON'T KNOW.... THEY IS THE SAME BRICK AND I LAID THEM THE SAME!"
"LEM, WHY DO THEM BRICK GET SOFTER NEAR THE BOTTOM EXCEPT WHERE THE FIREMAN DIDN'T CLEAN THE ASHES?"

Softening and Deformation of Firebrick

EVERYONE of us has walked on a brick sidewalk on a damp day and wondered why some of the brick appear dry and others wet. Upon closer examination we see that the wet brick were actually smaller than the dry ones. The larger, more porous brick absorb the moisture and look dry.

We have all noticed that the hard dense brick in a batch have "kiln marks" on one side. I am referring of course to building bricks. The harder a brick is burned the more the brick will shrink. In fact brick will shrink until they lose all semblance of grain or structure.

The softer the brick, the larger the pores which can absorb moisture. The brick with the kiln marks are those from the bottom of the kiln where they had to sustain the weight of the upper brick while at elevated temperatures.

The same firebrick that have a softening point of from 2400-2600 F when heated in an electric kiln will soften and deform at a temperature as low as 2000 degrees when located in the lower part of a boiler furnace where they are heated and subjected to the weight of the upper walls.

larly important that the treatment produce coats of uniform thickness at all times. It is necessary to produce varnish coats of substantially similar properties from the same varnish constantly. This requires an adequate control of the processing tanks. If the varnish is not kept uniform in its properties in the tank, there is little chance of securing uniform or satisfactory properties of resin insulation on the equipment.

This requires a frequent check and adjustment of the specific gravity, viscosity, and nonvolatile content in the tank varnish, and a thorough knowledge of the characteristics of all varnish added.

The viscosity of fluidity of the liquid varnish and the percentage of body or nonvolatile matter in the varnish determine the varnish film produced. Low viscosity and low body produce a thin coat with excessive drainage. High viscosity combined with a high percentage of nonvolatiles produces a thick coat that may be difficult to cure. There are several systems in industrial use for shop control of insulating varnishes. All embody daily checks and adjustment of the treating tanks and periodic chemical examination of the varnishes.

Conclusions

Proper varnish treatment of electrical apparatus is a function of the varnish selected, and the use to which the apparatus is subjected. No single varnish is suitable for all applications. A plastic, flexible varnish may be useful on one type of apparatus, but a hard tough varnish may be required for another machine. It is advocated that repair jobs be classified and proper varnishes stocked to take care of predominant types. Multiple thin layers of well-baked varnish are preferable to a few layers of thick, undercured varnish. For consistent results, control of varnish treating tanks has to be exercised. Viscosity, nonvolatile content and specific gravity must be checked constantly.

Proper varnish selection and correct application can decrease the amount of brush dust and dirt accumulating on insulated surfaces, increase the oil and moisture resistance of the films, and significantly improve the reliability of the apparatus in service.

Care of Idle Boilers

WHEN boilers are taken out of service for any length of time, corrosion may occur on the internal surfaces of the boilers unless certain precautions are observed. During periods of idleness, boilers may be laid up by one of the two methods described below. The choice of method is dependent on how long the boiler is to be out of service, and how quickly the boiler may be required back in service for regular steaming purposes in an emergency.

Dry Method

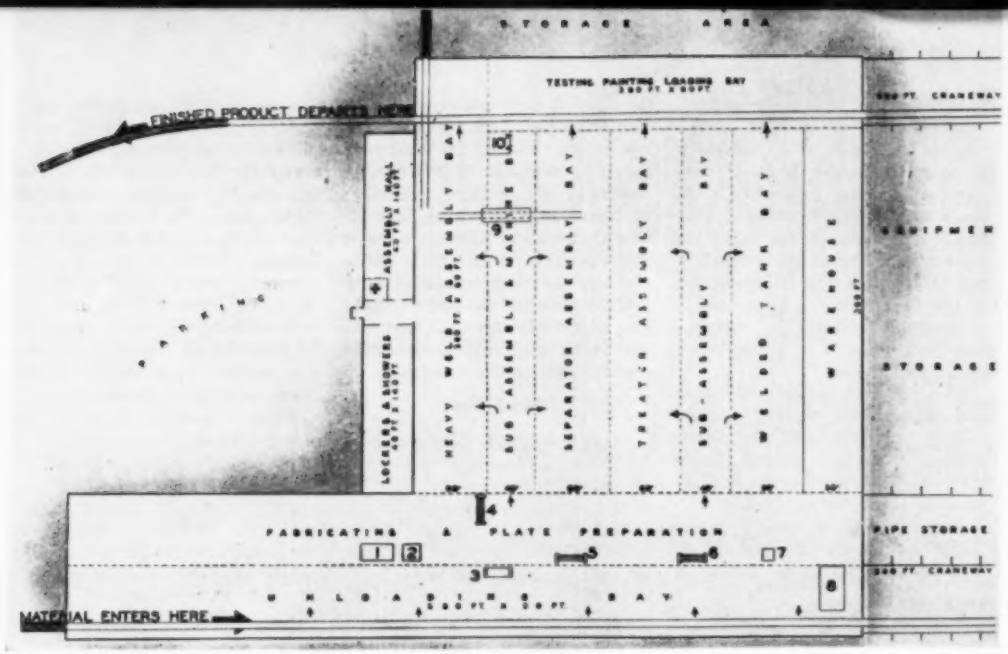
The dry method is preferable when a boiler is to be out of service for a month or more and will not be required for emergency purposes. The boiler should be drained, thoroughly cleaned and carefully inspected to insure all is in good order. The boiler should then be thoroughly dried internally by means of hot air stoves or a light wood fire. An amount of quick lime; approximately 30 pounds for each 100 boiler horsepower should be spread on watertight, wood trays placed in the boiler immediately after the drying-out process. If the boiler is HRT or locomotive type, a single tray resting on top of the flues or in the bottom of the shell will be adequate. In a multi-drum water tube boiler, a tray should be placed in each drum. The manheads, handholes and all connections on the boiler should be tightly blanked or closed after the lime has been placed in position. If the boiler is idle for a considerable period, it should be opened every three or four months for examination and renewal of the quick lime if necessary.

Wet Method

The wet method should be employed if boilers must be left idle for a period longer than a week with water in them, so as to constitute emergency service if required. The boiler should be thoroughly cleaned and carefully inspected to insure all is in good order. After the boiler is filled to the normal water level, the water should be boiled with the boiler properly vented to atmosphere for a short period. This procedure is necessary to expel the dissolved gases released from the water by boiling. The water should then be made alkaline in excess of 400 ppm by the use of caustic soda (approximately 3 pounds of caustic soda per 1000 gallons of water in the boiler). In addition, sufficient sodium sulfite should be added to the boiler water to produce a minimum residual sulfite content of 100 ppm (approximately 1.5 pounds of sodium sulfite per 1000 gallons of water in the boiler). After the boiler is cooled somewhat, but before a vacuum is created, the boiler should be filled completely and all connections closed. At weekly intervals, tests of the water should be made and the alkalinity and sulfite concentrations increased if necessary to maintain the recommended concentrations. It is advisable to keep the water in the boiler as cold as possible. Corrosion is promoted by lukewarm water. For this reason, feed valves and all steam connections should be tight at all times.

If it is necessary for such an idle boiler to be returned to service, the boiler should be blown down well before placing on line in order to reduce boiler water alkalinity and prevent carryover.

R. B. CONLAN
Chemical Engineer
W. H. & L. D. Betz



Key to Fabricating Equipment

1. 10 ft x 16 ft x 4 ft high thick plate furnace
2. Hydraulic press: 400-ton capacity
3. Heavy shear: ¾ in. x 10 ft long plate
4. Heavy plate rolls: up to 2 5/16-in. x 10 ft wide plate
5. Plate rolls: ¾-in. x 10 ft capacity
6. Plate rolls: ½-in. x 15 ft capacity
7. Circle shear: ½-in. capacity
8. Scrap bin
9. Stress relieving furnace: 7 ft x 7 ft x 40 ft
10. Dark room, instruments, test laboratory

Note: Transfer track, running from testing, painting, and loading bay, extends through storage area to a 15 ft x 15 ft x 100 ft stress relieving furnace and a test water supply tank of 1500 bbl capacity.

IN their Tulsa, Oklahoma, extensive fabricating facilities, the National Tank Company produces bolted, welded and wood tanks and welded vessels. Materials handling equipment, principally overhead and floor operated cranes, is playing an important part in the company's new welded vessel fabricating plant, now in full production.

Cranes are literally all over the 600 x 380 ft plant. The unloading bay is equipped with two special Milwaukee 5-ton cranes equipped with electromagnets. Pipe is unloaded and transferred to the adjacent bay or outdoor storage area.

CRANES Streamline National Tank

PAUL WHITEIS IS SHOWN OPERATING THE 400-TON HYDRAULIC PRESS IN THE PLATE PREPARATION BAY OF NATIONAL TANK COMPANY'S WELDED VESSEL FABRICATING PLANT. THE 400-TON GAP TYPE, HYDRAULIC PRESS HAS THREE RAMS; ONE UP-MOVING 100-TON RAM, ONE DOWN-MOVING 400-TON RAM, AND ONE HORIZONTAL MOVING 100-TON RAM.

TREATER ASSEMBLY BAY OF NATIONAL TANK COMPANY'S WELDED VESSEL FABRICATING PLANT IS EQUIPPED WITH ONE EDERER AND ONE MILWAUKEE 10-TON OVERHEAD CRANE AND CANTILEVER TROLLEY SYSTEM. NATURAL DAYLIGHT, ENTIRELY ADEQUATE FOR THESE HEAVY METALWORKING OPERATIONS, IS PROVIDED BY USING TRANSLUCENT FIBERGLAS PLASTIC SHEETS FOR SKYLIGHT AND WINDOWS. PLANT IS ALSO EQUIPPED WITH FEDERAL NOARK BUS DUCT, A PLUG-IN PREFABRICATED HIGH CAPACITY CONDUCTOR DESIGNED FOR INDUSTRIAL SECONDARY POWER DISTRIBUTION SYSTEMS.

The plate preparation bay is served by two Milwaukee 5-ton floor operated cranes. Two 5-ton overhead cranes serve the sub-assembly bay and one 10-ton Ederer and a 10-ton Milwaukee and cantilever trolley systems serve the separator assembly bay.

The sub-assembly and machine bay is equipped with a 5-ton overhead crane; the heavy weld bay with two 50-ton Ederer overhead units; and the testing and loading bay with two 10-ton overhead cranes extending 920 ft beyond the building making a ¼ mile craneway.

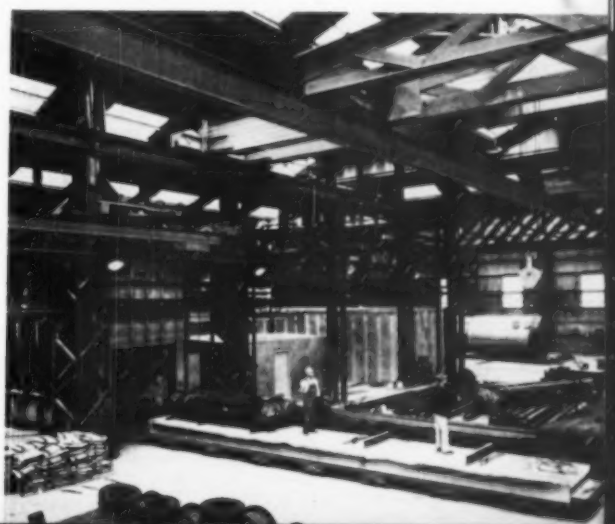
4,000 lb and 6,000 lb Clark fork trucks supplement the extensive crane installations in the warehousing and general shop operations.

Personnel

Metalworking operations in this phase of National Tank's operations are under the direction of plant superintendent Jack Shinkle; Mac Chestnut, assistant superintendent; Paul Whiteis, maintenance superintendent; Floyd Silvers, welding engineer; and F. J. Thompson, shop engineer.

Handling Company-Tulsa

THE HEAVY WELD BAY FACILITATES THE CONSTRUCTION OF VESSELS 12 FT IN DIAMETER, ANY LENGTH, AND SHELL THICKNESS UP TO 2-IN. THE STRESS RELIEVING FURNACE IS 15 FT X 15 FT X 100 FT IN LENGTH. VESSELS FABRICATED IN THIS PLANT ARE NEARLY 100 PER CENT ELECTRIC WELDED, WITH EXTENSIVE USE OF AUTOMATIC EQUIPMENT.



THE AUTHOR IS SHOWN REMOVING KNIFE STUDS FROM AN ATMOSPHERE CONTROLLED ELECTRIC FURNACE IN THE HEAT TREATING DEPARTMENT OF THE AUTO-SOLER COMPANY. THIS ATLANTA PRECISION METALWORKING PLANT PRODUCING HIGH SPEED AUTOMATIC NAILING MACHINES, WAS RECENTLY AWARDED A CONTRACT BY THE FRANKFORD ARSENAL FOR THE PRODUCTION OF RANGE FINDERS AND TELESCOPIC SIGHTS FOR 75 MM GUNS. SUCH ITEMS REQUIRE MANUFACTURING TOLERANCES OF 3/10,000TH OF AN INCH.

Know Your Heat Treater's Problems

Plant engineers can do a more effective job if they know some of the problems involved in heat treating special maintenance and standard production tools. Here are a few of the processing problems and how to avoid many causes of excessive tool breakage.

By John T. Wood

Heat Treat Foreman
The Auto-Soler Company
Atlanta, Georgia

THE Auto-Soler Company is a precision metalworking plant manufacturing high-speed automatic machines used in the leather, wood, and plastics industries to eliminate hand nailing operations.

My job covers production, metal processing, heat treatment, and welding, and the supervision of commercial heat treating contract work for other Southeastern industrial plants.

The principal equipment used in our shops for such work includes: 2 gas fired furnaces for salt baths, 1 Eclipse gas fired furnace for high speed hardening, 1 Stewart salt bath for cyaniding and nitriding, 1 Stewart forge furnace, 1 atmosphere controlled electric furnace, and 1 Homo circulating air tempering furnace.

Heat Treatment Important

Much of the success in the manufacture of a maintenance or production steel tool is dependent upon the heat treatment it receives. Assuming that good quality steel of the correct grade or type has been chosen and that a good tool design, coupled with good tool making has been employed, it lies with the final operation (the heat treatment) to either make or break the tool.

Supply All Data

Many heat treaters must be guided by data furnished in steel manufacturers' catalogs for treatment for certain types of steel. More often than not this data simply provides recommended hardening range, quenching media used and tempering range. Obviously, there are many gaps in this type of instruction.

Give your heat treater every scrap of information available. Write the exact trade name or analysis on the work ticket. If you don't know, tell him to spark it or give him drillings for analysis.

List present sizes and allowances for grinding to finish size. Give hardness desired and other physical properties. If you don't know, tell him what the material is you are forming, blanking or turning. If a maintenance tool, give full data on application.

Don't ask him to heat treat it as "hard as possible", or "file hard and tough". Maybe you're not guilty, but many jobs come to the heat treater every day with no more information than that.

The heat treater cannot analyze the steel by spark test but he can put it in its particular type group, then he can do his job of processing the steel.

For instance, several years ago when I was employed in a Nashville, Tennessee plant a fork truck ran into a steel rack loaded with bars which had been received the day before, but had not been marked. The identification problem was solved by sawing a disc off each bar, then spark testing and typing each piece.

The heat treater learns to see the steel in the sparks just as one hears a voice on the phone and recognizes it. If he doesn't recog-

Abstracted from an address by Mr. Wood before a recent meeting of the Georgia Chapter, American Society for Metals.

nize the type, then he can start on the hardening operation and as the steel is heated, can tell by sight when it goes through the critical range. He can then harden it in oil, make a test for hardness and determine what he has. He may have to either raise the hardening temperature or change the quenching medium. All this consumes valuable time, so give your heat treating department all possible information.

Decarburization

The presence of decarburization on the surface or cutting edge of certain tools is particularly objectionable, especially when a tool has been ground to size. Decarburization is the removal of carbon by oxidation from the surface of the steel being treated—with the result that full hardness will not be developed on the affected surface.

For preventing such decarburization, we use the following methods at Auto-Soler: atmosphere controlled furnace; packing in a medium containing carbon; heating in a neutral or carburizing salt bath; and heating in a carbon block.

Atmospheres

Different steels have different atmospheres for hardening. The type used determines the surface condition of the work after heat treating. An improper atmosphere can cause internal structure changes and affect physical properties.

An **oxidizing** atmosphere is one which is created by admitting more air than is needed to completely burn the fuel.

A **reducing** atmosphere may be present when an excess of combustible gases is present in the furnace because of operating with less air than that which is required to give complete combustion of the fuel.

A **neutral** atmosphere results when a complete balance is present and complete combustion takes place.

It is obvious that the problem of controlling the furnace atmosphere in such a way as to protect the steel being treated becomes quite complex.

Avoiding Common Heat Treating Troubles

Cracking—1. Improve design, giving generous fillets when possible in corners. 2. Make pieces in sections. 3. Use double and triple preheat when necessary. 4. Never underheat the metal. 5. Be sure of a uniform quench. Plug holes with fire clay or asbestos. Use jackets on corners that are sharp. 6. Do not overheat the steel. If overheated, cool to room temperature, then reheat. 7. Avoid scale or gas pockets which cause soft spots.

Warpage—1. Remove all mill scale from each side of the metal. 2. Avoid light and heavy sections. 3. Surface conditions should be the same on all sides. 4. Avoid gas pockets. 5 Stress anneal after machining.

Soft Spots—1. Correct quenching media. Never use tap water unless in a flush quench. 2. Maintain proper temperature of the bath. 3. Eliminate scale. 4. Have proper tongs for handling various classes of work. 5. Never allow parts to contact each other in the pack. 6. Keep compound clean.

Size Change—1. Heat properly. 2. Select proper steel (water hardening steels tend to shrink on hardening; deep hardening steels tend to grow). 3. Quench properly. Anneal cold drawn stock before machining.

Spalling—1. Reheat above the critical of the core and quench direct from the carburizing box. 2. Avoid improper use of grinding wheel.

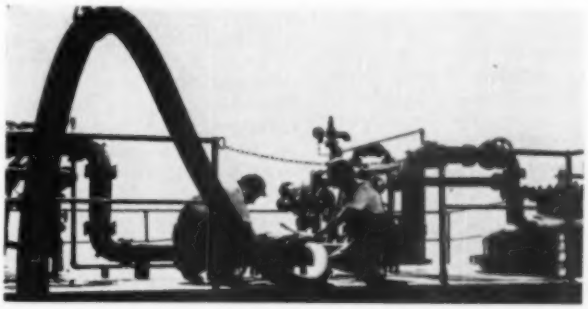
Many heat treating troubles develop before heat treatment starts. Consulting the heat treater beforehand is much cheaper than blaming him afterward. The best hardening is still done by the best heat treaters. There are many new modern devices to help turn out a better job, but on the other hand, specifications are now a lot tighter. The days of "pretty good" or "looks OK" are gone.

Texas Division of Dow Chemical Company Ships Acid in Rubber-lined Tank Barges

At Dow Chemical Company's Texas Division plant in Freeport, Texas, a hydrochloric acid barge is readied for loading. Five new 195 ft barges, built by Dravo Corporation, Pittsburgh, were recently placed in service by Dow.

Tankermen are connecting 4-in. line from dock to barge header for loading the acid. One barge carries as much acid as 29 railroad tank cars of 8000 gallons capacity each. Only one connection has to be made to load the barge, minimizing chances for spillage and saving wear and tear on equipment.

After the 1750 mile trip from Freeport via Galveston, the Intracoastal Waterway and the Mississippi and Ohio Rivers, barges are unloaded at Cincinnati.



A System of Water Treatment for Boilers up to 900 Psi -- With Low Make - Up

Part 2

This 3 article series describes a successful system of treatment including operating limits and methods of control. Part 1, published in August, presented Preparation of Raw Water Make-Up and Evaporation Operation. This, Part 2, covers Boiler Feedwater and Water in the Boiler. Part 3, in the November issue, will cover Chemical Analysis Correlation and Blowdown.

By Charles L. Wolff,
Plant Engineer
and
Irving Leibson,
Student Engineer
Florida Power and Light Company
Miami, Florida

SETTING and maintaining operating limits for boiler feedwater is of great importance in the system of boiler water chemical control proposed and described in these articles.

Normally the boiler feed tank is equipped with a deaerator and vent condenser. It is imperative that the vent condenser tubes do not leak in order that the small residual of gases which may yet be present will be effectively removed. Boiler feedwater pH should be maintained between 8.5 and 8.8. Boiler water should be recirculated back to the boiler feed tank through a small insulated line fitted with a calibrated micrometer valve. The capacity of the line should be sufficient to insure a boiler feedwater pH of at least 8.5 at high loads, and a pH no higher than 8.8 at low loads. A boiler feedwater of pH higher than 8.8 attacks copper bearing metals in the system; on the other hand, water with a pH lower than 8.5 does not provide adequate protection for the iron and steels in the system.

The proper micrometer valve setting for various loads must be determined by tests in each individual installation. In this manner, the desired pH may be maintained without adding further solids to the boiler. This method of boiler feedwater pH control is especially desirable in plants with economizers, where iron corrosion is more predominant than at any other point in the cycle.

A small continuous flow of sodium sulfite should be pumped to the boiler feed tank in order to eliminate traces of oxygen in the boiler feedwater system and to maintain a residual sodium sulfite concentration of 10 ppm Na_2SO_3 in the boiler. For installations not possessing a boiler feed tank, the sodium sulfite solution feed should enter the discharge header of the condensate pumps. For a boiler with a capacity of from 200,000 to 400,000 lb/hr, a typical sodium sulfite feed installation will feed about 1 to 3 pounds of sodium sulfite per day and therefore should include a sulfite solution tank of 25 gallons capacity and a pump of variable speed and stroke resulting in a sulfite solution flow variable between 3 and 15 gallons per day.

The pump suction line should leave the sulfite solution tank approximately six inches from the bottom and should be fitted with a tank shutoff valve. A tee should also be included in the line in order to provide a connection for a condensate flushing line. To meter sulfite flow to the boiler feed tank, a rotameter should be installed on the discharge side of the pump. The sodium sulfite feed line should enter the boiler feed tank about one foot below the lowest normal water level. This feed must be continuous because with batch feed, decomposition to sulfur bearing gases occurs in the boiler. This may be effectively demonstrated by batch feeding sodium sulfite and noting the odor of the gases leaving the steam jet air ejector. Sodium sulfite residual concentration in boiler water greater than 20 ppm Na_2SO_3 affects steam quality and is reflected in the condensate by an increase in conductivity. It is to be noted that further addition of sodium sulfite does not cause a proportional increase in sulfite ion concentration in the boiler water. From this evidence, we might infer the decomposition of sodium sulfite under these conditions in the boiler.

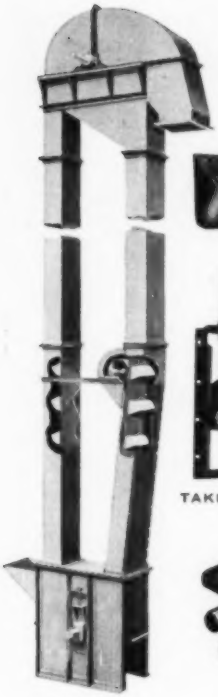
The concentration of sodium sulfite to be employed in the sulfite feed tank is determined by the degree of flexibility of sulfite pump capacity. However, if too low a concentration of sodium sulfite in solution is employed, a large percentage of the sulfite is oxidized to sulfate in making up the sulfite solution. On the other hand, if a high concentration is used, sodium sulfite tends to deposit in restrictions of the sulfite feed line on the suction side of the sulfite pump. This impairs flow and gives rise to spasmodic operation. To remedy this troublesome situation, a condensate flushing line should be installed on the suction side of the sulfite pump at the tee previously mentioned. The tank shutoff valve should be closed and the sulfite pump and line to the boiler feed tank should be flushed about two or three times a week.

Thus, by means of controlling pH and maintaining a residual sodium sulfite concentration in the boiler feedwater, corrosion in the boiler feed system is retarded.

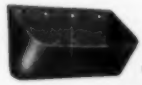
Simple Boiler Water Chemical Control System

The proposed system of boiler water chemical control is simple, positive, accurate, and trouble-free. It furnishes the power plant engineer with a method of chemical treatment and control for boiler

Continental ELEVATORS



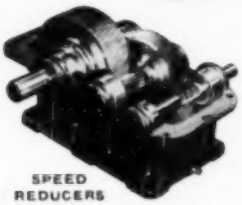
TYPICAL GRAIN ELEVATOR



BUCKETS (ALL TYPES)

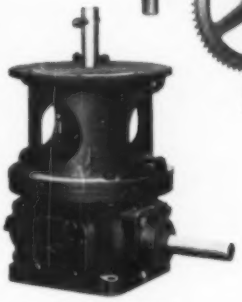
TAKE-UPS

PILLOW BLOCKS



SPEED REDUCERS

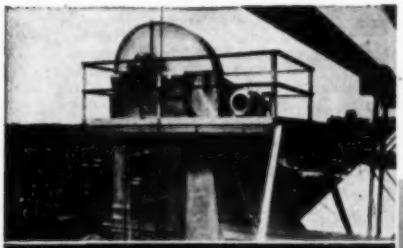
TOP DRIVE

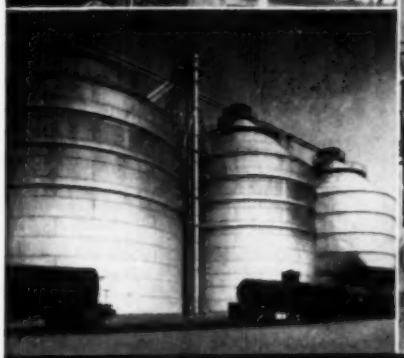


BOTTOM DRIVE

SPROCKETS AND CHAIN

SCREW ELEVATOR WITH FEEDER SECTION





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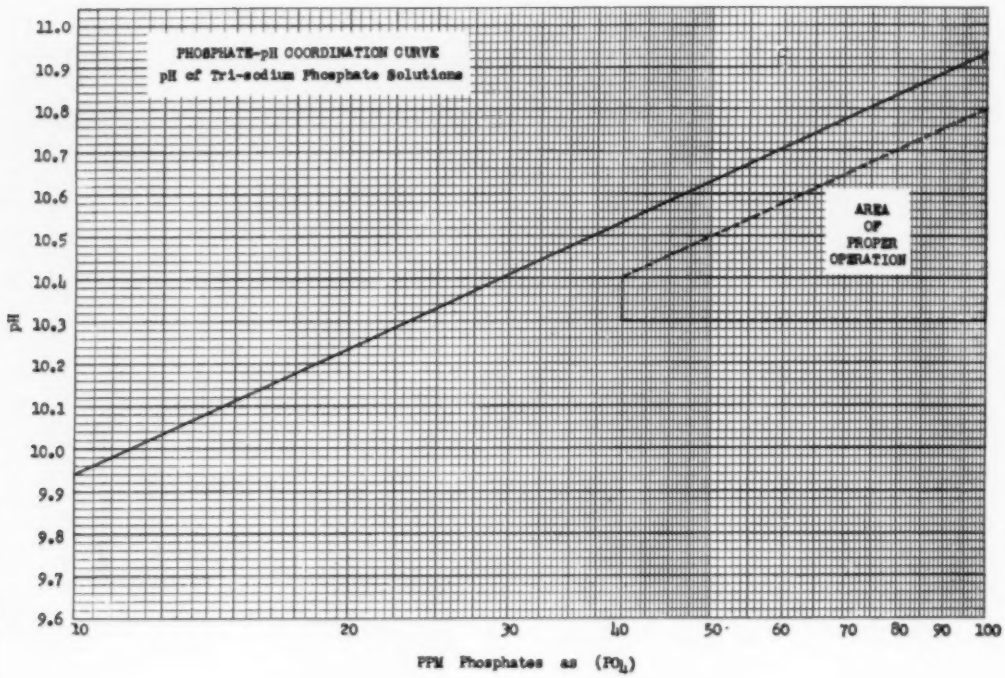
CG-5004

Industrial Division **CONTINENTAL GIN COMPANY** Birmingham, Alabama



Phosphate-pH Coordination Curve

Any possibility of embrittlement of the boiler metal is completely eliminated by the use of the **phosphate-pH coordination method.** The ordinates are pH and the abscissas are phosphates expressed as ppm PO_4.

The curve was derived by the authors from equilibrium calculations using the dissociation constants of phosphoric acid. A one hundred per cent ionization of tri-sodium phosphate is assumed. The values of the dissociation constants employed are those recommended by the National Bureau of Standards. This curve is theoretically sound and is believed to be more accurate than any of the curves reported in the literature. For phosphate concentrations at or greater than 100 ppm PO_4, the curve agrees very closely with the curves presented in the literature. However, at phosphate concentrations smaller than 100 ppm PO_4, the data in the literature are not accurate and show considerable error. These curves are, for the most part, based entirely on experimental work and the data reported do not satisfy fundamental theory for dilute solutions.

One would normally expect ionization to increase inversely with concentration and to be virtually complete at phosphate concentrations below 100 ppm. However, the curves given in the literature show a decrease in ionization at low concentrations. Contamination of solutions by soluble gases such as carbon dioxide (from air in the laboratory) would make accurate pH measurements impossible at low concentrations. Thus, this inconsistency is probably due to the comparatively large experimental errors encountered in work at such low concentrations.

The solid line provides an equilibrium relationship for solutions containing only pure tri-sodium phosphate. In the region below the solid line, mixtures of tri-sodium phosphate and di-sodium phosphate in varying amounts are present in the water. Fortunately, within the limits normally encountered in boiler water treatment, pH is nearly independent of the di-sodium phosphate concentration and is almost completely governed by the concentration of tri-sodium phosphate.

Equilibrium calculations, using the dissociation constants for phosphoric acid, show that if di-sodium phosphate is added to a solution of pure tri-sodium phosphate in a quantity sufficient to exceed the concentration of the tri-sodium phosphate present, the pH is lowered less than 0.02 pH units. Thus, if a point corresponding to the boiler water pH and total phosphates is located below the solid line, then the tri-sodium phosphate present may be found by proceeding to the left along a line of constant pH and reading the phosphate concentration at the point of intersection with the solid line. The differ-

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ence between the total phosphates and the value found for tri-sodium phosphate is the concentration of di-sodium phosphate in the boiler water.

For example, at a pH of 10.50 and a total phosphate concentration of 50 ppm there are 37 ppm tri-sodium phosphate (expressed as PO_4) and, by difference, 13 ppm (50-37) di-sodium phosphate present in the boiler water. In the region above the solid line, mixtures of sodium hydroxide and tri-sodium phosphate are present.

Because of possible inaccuracies in the pH and phosphate tests, the boiler water pH should never be allowed to approach the solid line closer than within 0.1 pH units. The boiler water pH corresponding to the residual soluble phosphate concentration, should be held between 10.3 and 10.8, preferably close to 10.5. The desired area of operation is enclosed by the dotted lines. Within this region of operation, a sufficient excess of di-sodium phosphate is present to react with sodium hydroxide which may result from the decomposition of incoming alkalinity.

Thus, if the conditions of the desired area of operation are maintained, a mixture of tri-sodium and di-sodium phosphates with no sodium hydroxide, is obtained upon evaporation of the boilerwater, and there can exist no possibility whatever of caustic embrittlement.

water that is at once both practical and theoretically sound. The proper application of this method will insure longer life for equipment and a minimum of costly maintenance. In order to attain the minimization of scaling, embrittlement, corrosion, and boiler carryover, as set forth in the opening paragraph of this article, the actual boiler water chemical tests required are pH, phenolphthalein alkalinity, methyl orange alkalinity, chloride, sulfite, phosphate, sulfate, and silica.

Scaling, with resultant losses in heat transfer and costly repairs, may be prevented by maintaining a residual soluble phosphate concentration between 40 and 100 ppm PO_4. This results in boiler water of zero hardness. Phosphate residual may be maintained by use of mono-sodium phosphate, di-sodium phosphate, and tri-sodium phosphate. The proper choice or mixture depends on the desired effect on the pH. The use of mono-sodium phosphate reduces the pH, tri-sodium phosphate increases the pH, and di-sodium phosphate has almost no noticeable effect on the pH.

Continuous feed of phosphates and all other chemicals to the boiler drum should be utilized as much as possible. Carryover with resultant turbine blade and boiler feed water deposits is likely to occur when chemicals are "shot fed" or fed over a relatively short period of time.

Corrosion, with resultant deposition of black magnetic iron oxide and pitting of metal, is kept to a minimum by the careful control of pH and the maintenance of a sodium sulfite residual concentration in the boiler water. The boiler water sulfite concentration should be maintained between 10 and 15 ppm Na_2SO_3 with outside limits of 10 to 20 ppm. If this concentration is allowed to rise above 20 ppm, decomposition, forming sulfur bearing gases, takes place in the boiler. This is reflected in the condensate by a rise in conductivity. Many condenser jet bank failures are directly attributable to these destructive gases liberated by sulfite decomposition.

Any sudden or gradual increase of sodium sulfite consumption above normal should be the subject of immediate investigation. Complete dissolved oxygen tests should be made in addition to the normal schedule. Waters that should be tested frequently include condensate, low pressure heater drain pump discharge, and evaporator preheater effluent. Oxygen leakage in excess of 0.03 ml per liter should be investigated. Many modern condensers have a dissolved oxygen concentration of less than 0.005 ml per liter in the condensate discharge.

At present the only means of removing silica from the boilers is by blowdown. However, careful operation of the evaporators to prevent carryover will contribute toward a reduction of silica in boiler. Silica limit may at firs' be set at 8 ppm until experience is gained. After observation of turbine blading silica limit may be raised slightly each overhaul until a satisfactory maximum can be established for a particular boiler plant.

Boiler carryover may be minimized by proper boiler drum design, continuous chemical feeds, use of continuous boiler blowdown, and avoidance of sudden load changes. Excessive boiler carryover is often responsible for high condensate conductivities, heavy turbine blade deposits, heavy condenser tube deposits, and low pressure heater deposits.

The total solids concentration of the boiler water may be employed as a convenient index of boiler carryover. Boiler water total solids concentration is arbitrarily defined as the sum of the methyl orange alkalinity as ppm $CaCO_3$, chlorides as ppm NaCl, sulfates as ppm Na_2SO_4, sulfites as ppm NA_2SO_3, phosphates as ppm PO_4, and silica as ppm SiO_2. For many boiler waters commonly encountered, the total solids value calculated in this empirical manner is found to be very close to the theoretically correct value calculated from hypothetical combinations.

To minimize carryover with its resultant difficulties, the total solids concentration should be held below 500 ppm by employing continuous boiler blowdown. This figure is somewhat smaller than the standard guaranty for steam purity (1250 ppm at 900 to 1000 psig) as specified by the American Boiler Manufacturers' Association. This substantial safety factor is made possible by the low makeup water rates employed.

The final (Part 3) installment of this series will appear in the November issue of SPI and will discuss Chemical Analysis Correlation and Blowdown.

HOTTER, SOONER steam traps..
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Rx LUBRICATION

By C. J. Copley and Will Risk

Part XVI—Lubricating Devices

What happens to a man who eats no food? What happens when an industrial machine is fed no oil or grease? Two questions with only one answer. They suffer—maybe to the point where they can go on no longer.

After death there is a post mortem by the authorities. The official report reads death due to starvation. Sorrow and sympathy is in order. No one in particular is likely to be blamed. Few if any questions are raised about the quality or amount of food offered to the man.

In the case of a "dead machine," however, there is never any funeral. Somebody in the plant puts in a call for action and mechanics proceed to put life back into the machine. It is vital to production and profit-making. If the machine is especially vital, the tempo of the 'life-giving-process" may be carried on at a furious pace.

But always in the case of every well managed plant, there is a post mortem held over any prostrate machine. No flowers. No sympathy. Only a searching analysis for reasons why the machine failed. If the post mortem is not held while the machine is down, it will surely be held as soon as all interested parties can be brought together. And this is where the man interested in lubrication comes in.

If it is suspected that any machine part has been starved for oil or grease—lacking in lubrication—here is what one can expect to hear. . . . What kind of oil was used? Is the lubricant approved by the builder? How long has it been since the machine was last lubricated? Has enough lubricant been used? Did dirt or contamination get into the machine through the oil? Was there a human failure in connection with application of the lubricant? If so, should the machine be equipped with a suitable lubricating device?

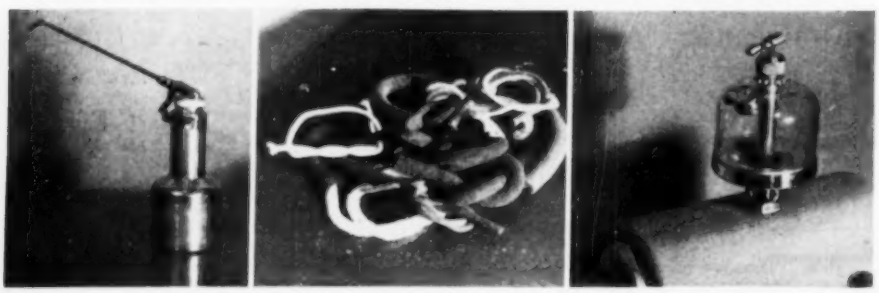
——FUNDAMENTALS OF PROPER INDUSTRIAL LUBRICATION——

Now it is not the purpose of this part of the LUBRICATION NOTEBOOK to 'hatch out' a lot of fine answers which will absolve everyone of blame when a machine fails. Rather, it is our purpose to discuss the importance of lubricating devices and how to take care of them.

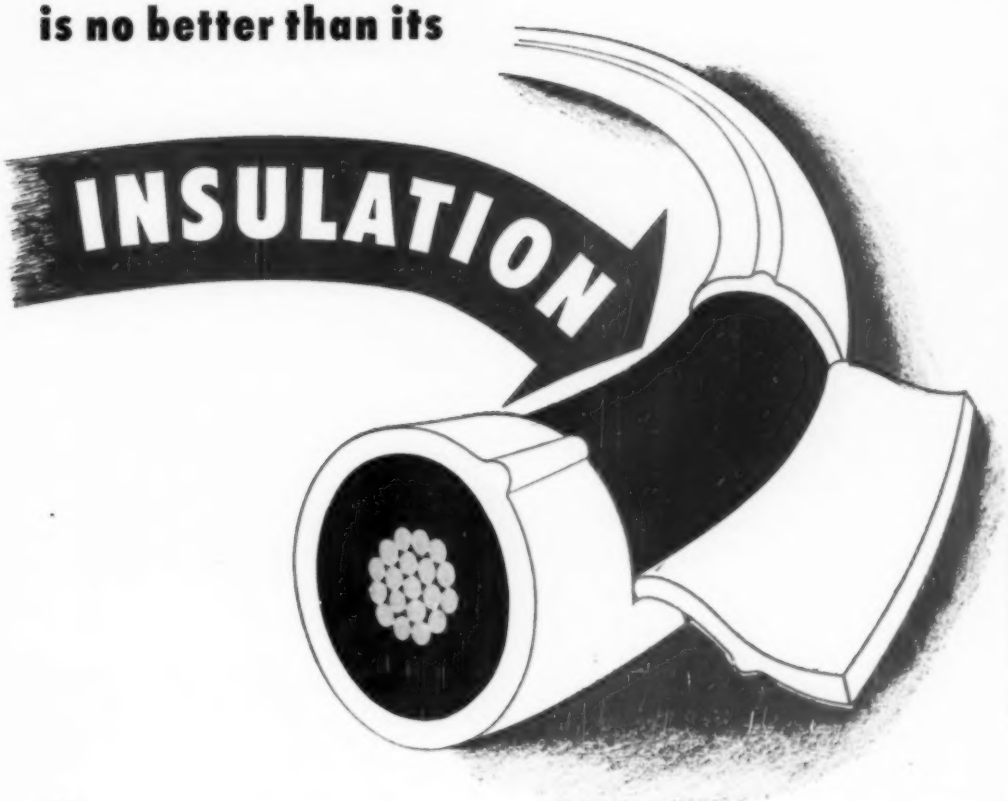
But first let's review briefly the basic fundamentals of industrial lubrication. There is the LUBRICANT—the MACHINE to be lubricated—and the WAY the lubricant is applied to the machine.

Lubricant, method, machine . . . that is all there is to correct industrial lubrication. It can be expressed like this . . . in order to assure the use of proper lubricant in the proper place and the proper way, first select the right lubricant, see that it is applied in the right way.

A Pistol-Type Oil Can. Wool Felt. Plastic Sight Feed Cup



an electrical cable is no better than its



An electrical cable is only as efficient and long-lasting as its insulation. You will find true cable economy *only* in the cable with the best insulation. Because electrical insulation is so vital to cable performance, it is important to know what makes one type of insulation better than another.

There are three basic factors determining the electrical and mechanical characteristics of rubber cable insulation.
1. The type and grade of rubber used in the compound.
2. The method of applying the insulation to the cable.
3. The method of vulcanizing the insulation.

In Okonite insulations, each of these three points is a reason for superior performance. First, Okonite uses only Wild Up-River Fine Para rubber – the very finest obtainable – because this rubber has proved during more than 70 years of actual use to have better dielectric and aging qualities than any other.

Second – the unique Okonite strip method of applying insulation assures absolute uniformity of wall thickness . . . perfectly centered conductors. This advantage, guaranteed only by the strip method, is another reason for the famous long life and dependability of Okonite-insulated cables.

Third – after the insulation has been applied by the strip method, it receives a *single* vulcanization in a continuous tin mold, under high pressure. Advantages of this exclusive process are an insulation of higher density, greater physical and electrical uniformity.

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The right way is directly related to the lubricating device. In fact the RIGHT WAY is the selection and proper use of the RIGHT LUBRICATING DEVICE.

THE RIGHT WAY TO APPLY LUBRICANTS

The dictionary says a device is a "contrivance, invention, thing adapted for a purpose." In the case of lubricating devices this means a hand-oil-can, a wick feed cup, a drop feed oiler, a constant level oiler, a grease cup, a grease gun, a force feed lubricator and a central oil or grease system—to name only a few of the common types of lubricating devices.

Although it is true that there have been many types of lubricating devices developed, their adaptation to industrial machines has lagged behind the development of special lubricants. A trip to any but the most modern plant will quickly prove that operators have been slow to adopt better methods of applying lubricants. This is true in spite of the fact that many economies in consumption, labor, power, and maintenance can often be accomplished through the use of relatively inexpensive lubricating devices than can be obtained through the most painstaking selection of lubricants.

Even though lubricating devices are nothing more than tools for applying oil or grease to holes on a machine, the tools have to be selected properly. Some devices are better for some purposes than others. For every piece of industrial machinery there is a best way to apply the lubricant. The device determines whether "full value" in terms of lubrication benefits are realized from the oil. The following information on some of the most common devices describes how they function and how they should be maintained. What is said about any device applies to old or new machines, old or new plants.

DEVICES

The Oil Can is an old friend if there ever was one, but it is taken advantage of all too often. Although indispensable, it can lead to the waste of much oil if not used and treated carefully.

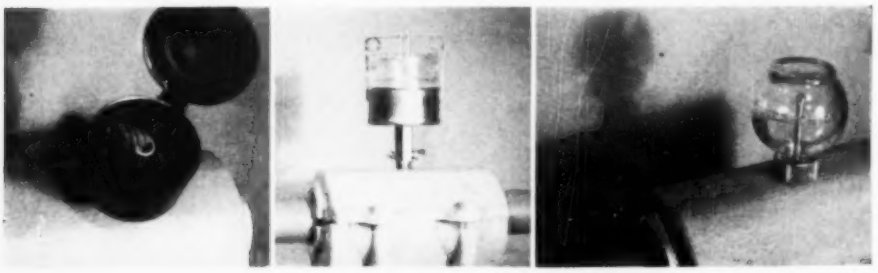
The oil can is, of course, the symbol of "feast or famine" lubrication. At the moment it is being used, the oil hole is flooded with oil. Before it is made to poke its snout into the oil hole again, the bearing is probably starved for oil and that is not good for the machine.

The common oil can, old as it may be, should be kept in good repair at all times. The opening at the end should be kept free and round. The whole can should be cleaned at intervals to avoid accumulations of dirt or abrasive particles that may get into the bearings of the machine to promote wear. If the spout becomes clogged, it must be cleaned immediately. Select the can so the spout opening is correctly sized for the bearing holes to avoid excess drippage at the time of application. If the size of the spout is too small, do not clip off the end. To select an oil can with a spout tailored to the needs of the bearing is to conserve oil.

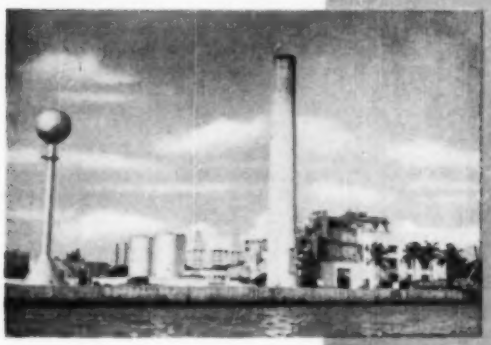
Pistol-Type Oil Can—An improvement over the common oil can is the pistol-type oil can. A plunger at the bottom of the inside of the oil can forces oil out the spout through a small opening. Most cans of this type can be adjusted to deliver a controlled amount of oil with each stroke. Such a can is positive in action and does not have to be held straight up and down over the oil hole. It is more economical in the dispensing of oil, but requires a "kerosene cleaning" from time to time just like the common oil can.

Pieces of Felt or Waste—Such devices depend on the principle that once the waste or felt is soaked with oil it gives up this oil to the machine part slowly. Felt can be purchased in all shapes and forms for

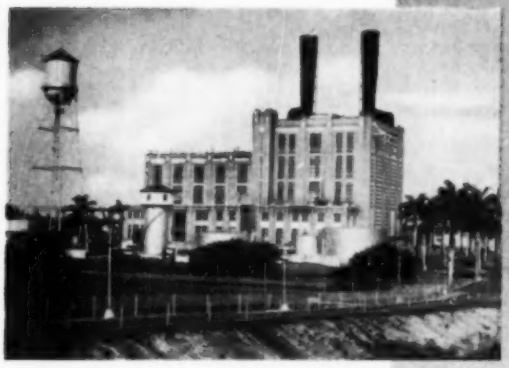
TWO TYPES OF WICK FEED CUPS ARE SHOWN IN THE LEFT CENTER VIEWS. AT LEFT, AMOUNT OF FEED CAN BE ADJUSTED BY REDUCING THE NUMBER OF STRANDS OF WOOL. TO STOP THE FLOW OF OIL, REMOVE WICKS FROM STAND-PIPE. WICK FEED CUP IN THE CENTER IS MADE WITH A BOTTLE INSERT. TYPICAL BOTTLE OILER IS SHOWN AT THE RIGHT. SHAFT RIDES ON BEARING JOURNAL.

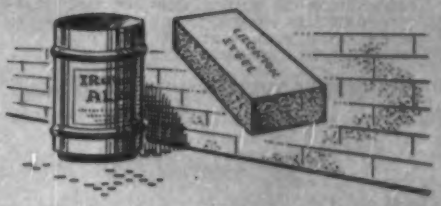


MORE ELECTRIC POWER FOR THE HOMES AND INDUSTRIES OF THE SOUTH . . . AND LESS REFRACTORY MAINTENANCE WITH "IRONTON STEEL"



FIRE BRICK . . . that's the promising outlook for these new Southern generating plants. The boiler and furnace brick work . . . *in areas where severe conditions are expected and where failures of the refractories would cause expensive shut-downs* . . . has been constructed with "Ironton Steel" Fire Brick. Kentucky clays of unusually high refractory value, subjected to high vacuum when formed in power presses, produce a brick that is dense, uniform, structurally strong and resistant to erosion and spalling.





"IRONTON ALSET" is the perfect bonding mortar for "Ironton Steel" brick. This air-setting high temperature cement is made to form a joint actually stronger and more refractory than the brickwork. It seals against gas and air. It works easily as mortar, dip, or spray. Ironton representatives in the South can tell you more. Call the nearest one listed below.

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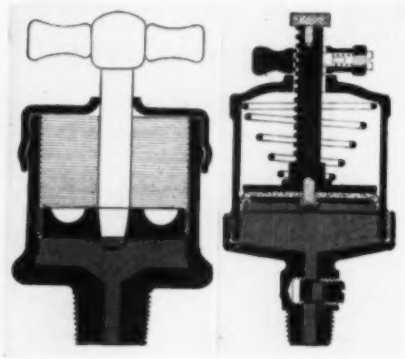
this purpose. In the sense that they hold oil and feed it to the bearing more slowly, they are automatic.

The difficulty with such an oiling device, however, is that they do not provide a constant feed. If the surrounding temperature rises or falls sharply, they will give up all the oil they hold or refuse to give



TYPICAL SCREW-DOWN CUP SHOWN AT LEFT. GREASE INTRODUCED WHEN HANDLE OR COVER IS SCREWED BY HAND. IN THE COMPRESSION CUP AT THE RIGHT, GREASE IS FORCED INTO BEARING BY SPRING. SET SCREW SERVES TO REGULATE THE FLOW OF GREASE.

up enough for the lubrication process. Their ability to function properly is also impaired when they become clogged with lint, dust, or dirt.

At best, such devices only decrease the process of "feast or famine" lubrication and do require considerable attention. They should be replaced in the bearing hole frequently, but seldom, if ever, are.

Oil Cups—Oil cups are merely auxiliary oil reservoirs fastened to the oil hole. Oil feeds from them to the oil hole by gravity. While they decrease the "feast or famine" cycle of lubrication, they are of limited use on anything but very small bearing surfaces. Equipped with a cover—either a hinged lid or a self-sealing ball and socket opening—they do keep dirt and dust out of the oil hole.

Oil cups should be kept tight in the oil hole. Replace when the cover is broken or their self-sealing opening is damaged. Remove and clean when dirty.

Sight-Feed Cups—Sight-feed or gravity feed cups represent one of the first types of semi-automatic oiling devices. They are filled by oil can. Oil flows by gravity to the oil hole on the machine. Feeds can be adjusted. The oil supply is always visible. They can be turned on or off as the machine is started or stopped. To avoid breakage of the glass reservoir, they are sometimes made with unbreakable materials.

Temperature changes due to the atmosphere or induced heat from the machine cause the rate of oil flow to vary. This, plus the fact that they have to be turned on and off, limits their use. With failure to turn one of them on, the bearing suffers and rapid wear results.

In the operation of a sight-feed cup, be sure to keep the fill plug closed, the oiler turned on before the machine is started, adjust while the machine is in operation for proper oil supply to the bearing, clean when dirty, and readjust with seasonal changes if located out of doors.

Wick-Feed Oiler—Wick-feed oilers are semi-automatic devices that work on the "lamp wick principle". Oil in the chamber seeps up through wool wicks and over the stand-pipe of the oiler into the oil hole. The amount of oil flow depends on the number of strands of wool used. To stop the flow of oil, the wicks are taken out of the stand-pipe and folded into the oil reservoir.

This type of oiler is simple in construction, comes in large or small sizes, is easy to fill, and permits a regulated and positive feed when properly used. It is not fully automatic because it has to be stopped and started with the machine. If it is desirable to see the oil level in the device, wick-feed oilers can be obtained with glass reservoirs. Large multiple feed wick oilers can also be obtained for feeding oil to several bearings from one large oil reservoir.

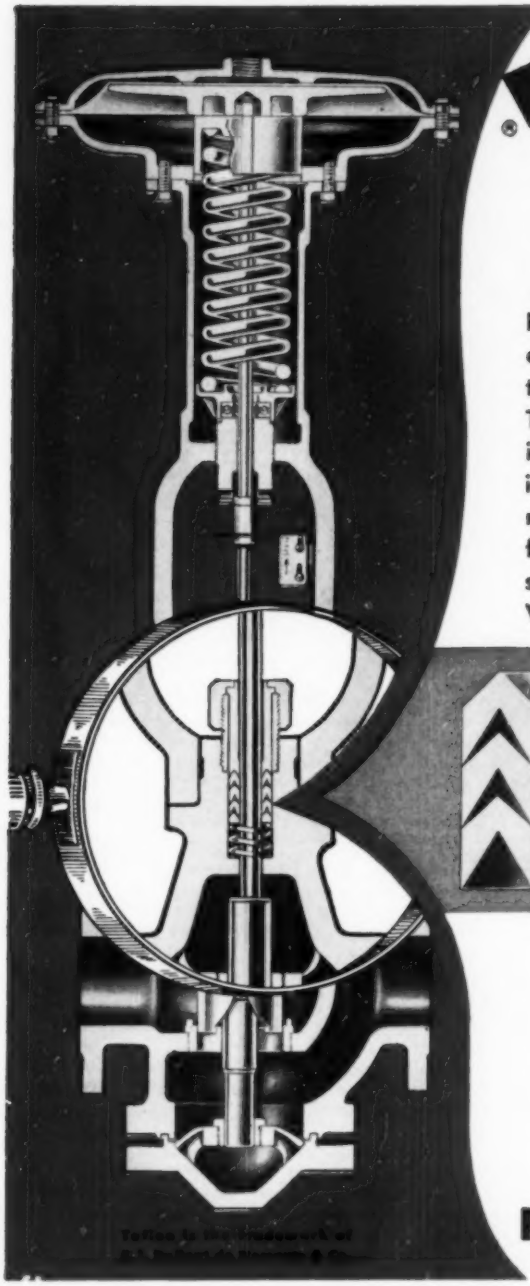
To get maximum results from a wick-feed device, these things should be done: Do not fill above the stand pipe. Adjust feeds by regulating the number of wicks. Start oiler a few minutes before the machine is started. Stop oiler after the machine has been shut down. Keep oiler at least half full. Strip wicks with fingers occasionally. Renew wicks when dirty. Keep device closed. Take off and clean when dirty.

Bottle Oiler—Bottle oilers are fully automatic. They feed oil through the oil hole only when the bearing is in operation. On the basis of many years of practical experience, this device has proven to be remarkably effective and a low cost device for providing a reliable, uniform feed over a wide range of applications. With this device it is possible to show amazing savings in oil consumption and, in addition, provide adequate lubrication.

The bottle oiler consists of three essential parts: the glass bottle, a tight-fitting cap, and a spindle fastened at one end so as to ride on the bearing journal. Where the bearing hole is close to a vertical surface, the glass bottle is made with a flat side.

In use, the bottle oiler is filled with oil and placed in an inverted position, with the cap down, and so supported by the bearing hole that the end of the spindle rests on the journal of the bearing. When inverted, it is air-tight except for the spindle clearance. Oil cannot leak out unless air in the bottle expands or additional air enters. When the temperature ofthe bottle oiler rises, due to heat from the bearing conducted by the spindle, the resulting expansion of the air in the bottle expells some oil. When the bearing is stopped, the lowering temperature causes the air in the bottle to contract and the flow of oil stops.

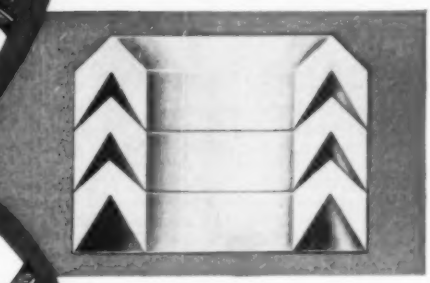
IT'S *New* AND A *Natural*



FISHER *Teflon*

V-RING PACKING

Fisher Teflon V-ring Packing has been adopted as standard available construction for all Fisher diaphragm motor valves. Teflon is tough, resilient, and chemically inert. Its smooth soap-like surface makes it ideal packing for control valves. After more than two years of laboratory and field testing Teflon in various forms and shapes, Fisher engineers decided upon the V-ring construction as ideal for packing.



Fisher Teflon packing cut in section to show V-ring construction.

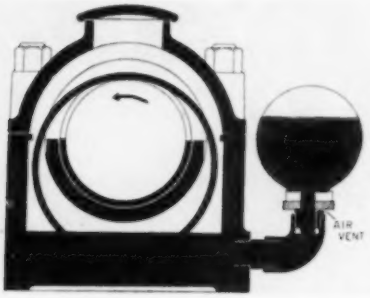
Advantages of Fisher Teflon V-ring packing:

- *Economical*
- *Minimum leakage*
- *Low maintenance*
- *Reduction of packing friction*
- *No corrosion*
- *No product contamination*

FISHER GOVERNOR CO.

MARSHALLTOWN, IOWA

To obtain best results from a bottle oiler, these cautions should be observed: Fill the oiler within one-half inch of the top only. Be sure the spindle is free in the cap and rides on the shaft of the bearing. Do not use where the method of support is too loose for the oiler will be jarred out of place with motion of the machine. If the bearing is longer than six inches, use at least two oilers. Larger bearings require special consideration.



A TYPICAL CONSTANT LEVEL OILER INSTALLATION. SUCH DEVICES CAN BE PURCHASED READY MADE, BUT THIS ONE WAS MADE WITH A BOTTLE OILER AND ORDINARY PIPE FITTINGS.

The most extensive applications of bottle oilers is on bearings of general shafting. This method makes it possible to use the correct oil possessing the highest lubricating qualities at an expense far below the cost of inferior oils that must be copiously supplied to be effective. The inaccessibility of widely scattered shaft bearings makes the savings in labor for oiling, due to the use of these oilers, an item of importance also.

Constant Level Oilers—Constant level oilers are devices used to maintain a constant level of oil in a ring-oiled bearing or an oil lubricated anti-friction bearing. They are attached by a pipe to the bottom of the bearing. The supply of oil is always visible and can be renewed without stopping the machine.

The following things should be observed for their most efficient operation: Install a level feed line from the oiler to the bottom of the bearing. Adjust oiler for proper oil level in the bearing. Keep clean. Keep filled.

Grease Cups—Grease cups are of the screw-down or compression type. In both cases they consist of a reservoir and a method of forcing the grease into the grease-hole in the bearing. Screw-down cups are hand operated and require frequent attention. Compression cups make use of a spring to obtain a more-or-less regular flow of the grease. As these cups empty, though, the flow becomes less as the spring is extended.

Some greases separate into soap and oil when used in the compression cup, so this fact should be taken into consideration when selecting the grease. Cups that are hand operated should not be installed where it is unsafe for a man to reach over or between moving parts of a machine. Always see that the grease hole is free of dirt or deposits at periodic intervals. Use only clean grease. Wipe clean before filling.

Grease Guns—Grease guns are much used in industry. They are either operated by hand, air, or electricity. There are so many makes and varieties that no attempt will be made to describe them. And anyway, nearly every filling station has a representative display.

There are a very few simple rules to follow in order to secure best results with them. Wipe every fitting before forcing the grease into the bearing. Don't lay the grease gun down in a dirty place. Before the gun is filled, wipe it clean so no dirt gets into the grease barrel. Don't use a gun for two different kinds of grease unless it is thoroughly cleaned between fillings. If at all possible, use two or more guns where the plant uses more than one lubricant.

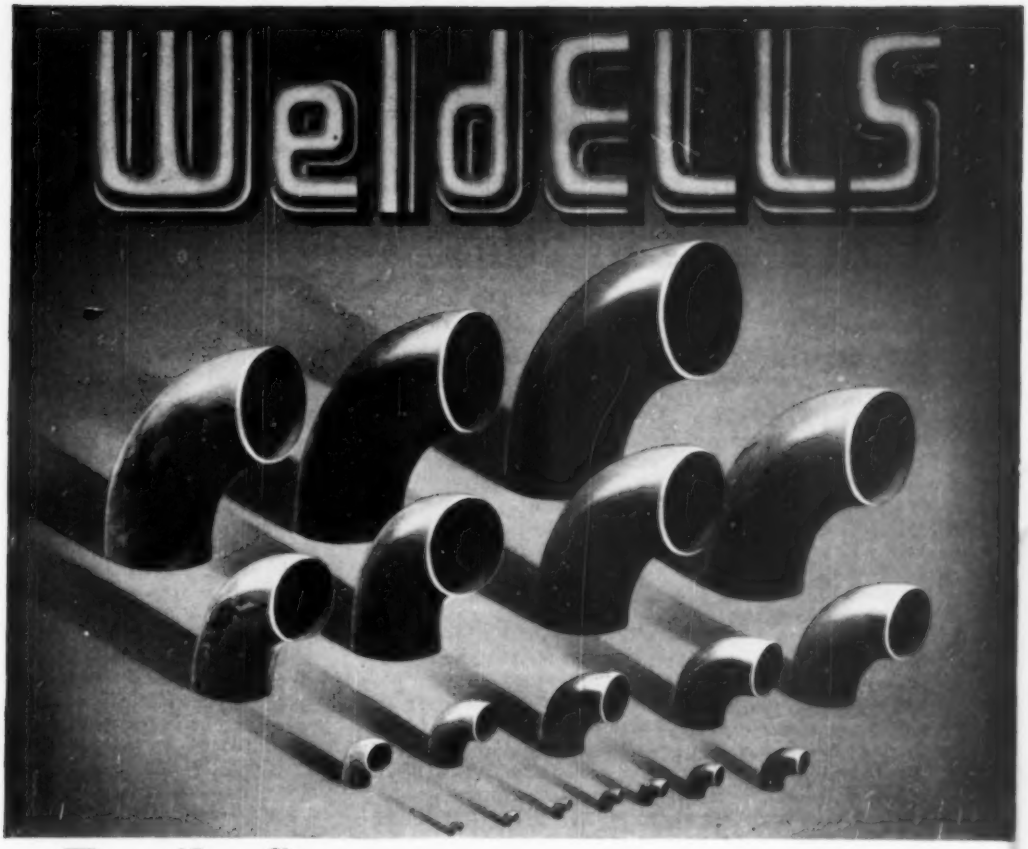
—USE CARE IN SELECTING THE CORRECT LUBRICATING DEVICE—

From the foregoing it is apparent that some lubricating devices are better for some purposes than others. The selection of any device should—and there are many other devices space does not permit us to discuss—be made on the basis of plant experience with particular devices or after consultation with a lubrication engineer or device manufacturer.

To guide the selection of any device, these are important points to keep in mind:

1. Which is easiest to install on the machine?
2. Does it keep dirt out of the bearing?
3. Does it save the lubricant?
4. Does it save oiling time?
5. Does it help take the guess work out of lubrication?
6. Is it capable of feeding the oil or grease which was properly selected for the bearing?
7. Considering the limits of the device, will its installation promote the safety of the men doing the oiling?

In the final analysis, of course, there is one thing that cannot be questioned. Hand-oiling is the poorest way to lubricate: automatic or semi-automatic devices are in the right direction because they do the most to overcome the "human element" in lubrication costs and interruptions in production due to faulty lubrication.



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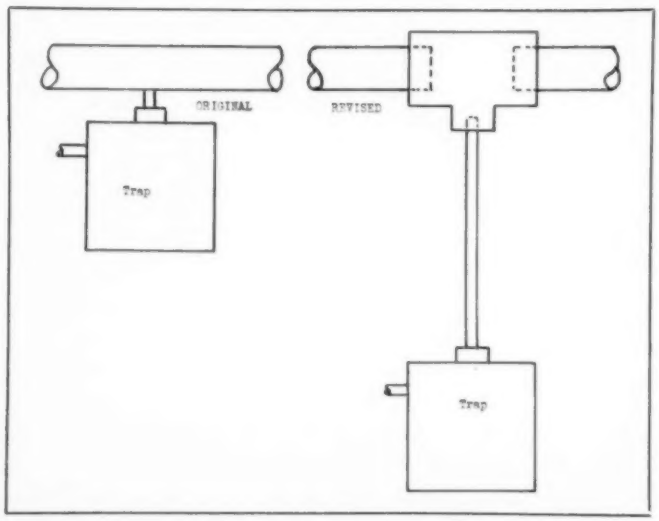
Removing Trapped Moisture

THE air lines serving the spray booths were properly designed and of capacity sufficient to provide maximum air demands without causing pressure drops which might change the dew point of the compressed air, and thus cause moisture to settle out. Yet, almost from the first, the rejects from water in the finishing materials ran high.

A 2-in. main, carried overhead from the air receiver to the booths, was equipped with a trap at the point where it branches to serve the spray guns. This float operated trap was fed entrained water from the air stream through a ½-in. nipple, welded into the bottom of the line. The nipple itself was welded over a hole or perforation in the wall of the 2-in. pipe with the welder's torch.

Checking the blueprints of the original design showed that specifications had not called for the method followed in the tie-in. It was an "improvement" or "cost cutter" introduced by the pipe contractor. When the trouble was found, the line was cut, and a 2 x ½ x 2-in. tee cut into the line where the nipple had been welded, with a drop leg of 12-in. of pipe replacing the 2-in. nipple formerly used to join trap to line. With the added distance between trap and line, coupled with the chamber formed by the tee itself, moisture removal was complete, or at least adequate to reduce the rejects to the desired ratio.

The trouble was analyzed as being the sudden release of air carried by the condensate in the trap when pressure was released or reduced on the line at the same time that the trap automatically opened to discharge its load. These air bubbles, bursting as pressure was reduced, carried a fine spray up through the short nipple, and a few of the droplets thus formed entered the air stream to the spray guns, and thus were spattered onto the work.



The tee as point for taking off the line to the trap was introduced after study of air being carried through a plastic section let into an air main. Tiny drops of condensation are not rolled along the bottom of the pipe as might be expected, but instead are moved along the sides of the pipe much as droplets cross a windshield laterally under the urge of a strong wind. These droplets are, in fact, fairly regularly distributed around the entire circumference of the pipe, and move along the wall at a rate dependent upon air speed. Only when air flow is stopped do the droplets tend to run together into the bottom of the pipe. And once there, they tend to be broken up again when rapid travel of air through the pipe is resumed.

The break in continuity of the pipe wall formed by the tee allows the droplets to trickle over the end of the pipe, and to collect and run down in the area where the pipe edge or end forms a slight lee and air currents are lessened. Once in the lower portion of the tee, the drops find their way into the drop leg and enter the trap.

The 12-in. lift from surface of the liquid in the trap to the air main is enough for any droplets which may be formed from pressure drop to fall back before they can reach the level of the main line.

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Solving Sand Handling Problems

By H. B. McDermid

SAND handling is now done by many kinds of machines—shakeouts, hoppers and chutes, conveyors of several sorts, rotary or plain vibrating inclined screens, elevators of several sorts, sand mixers for the next trip to the molding floors over more conveyors, etc.—too long a list to enumerate here. To keep the sand moving constantly and freely through such a system is a job fit to keep an experienced man on his toes with never ceasing vigilance.

Wet Sand

Handling moist sand requires close attention. If a large body of too moist sand is allowed to start through while the system is adjusted for sand of normal moisture content, the engineer may be forced to fight for hours to keep his system performing in any way at all. Such a result may come from the actions of men who lay off their regular shift on a Saturday night, leaving the late Saturday "pour" to stand until Monday morning, absorbing moisture from a humid atmosphere. Then instead of a three per cent normal, the system has to try to handle sand with a moisture content of twelve to fifteen per cent. This is particularly hard to do through screens, but such extreme moisture changes also work havoc in other hard to handle "sticky" spots where the system is just getting by at best.

Life is too short to expect to get a designing engineer who can lay out a perfect system that will never give trouble at any point under any conditions that may be encountered. Bad or "sticky" points may always be expected to show up. Some of these can perhaps be eliminated by re-design where such changes are possible. Others can be helped by installing a vibrator on the outside of the sheet that "sticks".

Another trick that is good if used before the sheet has corroded, is to clean the sticky spot as thoroughly as possible, and then paint the bad spot where the sand sticks with an oily mixture. A good one is made of lard oil and kerosene in equal parts, and if properly placed at intervals of perhaps one to two weeks, depending on conditions, will often help tremendously. To get best results, it should be applied early in the service life of any system, before the sheets have corroded under the sticky sand which has lodged at the bad spot. Later the necessary cleaning may be too hard to do, and the only cure may be to replace the bad sheet and then steadily oil it faithfully. If lucky, you will get a glazed spot that sand can't stick on, instead of a corroded one that it always sticks on.

Design for Relief

Often before a new system "shakes down" there will be places found where some unit will be loading up because it is not speeded high enough to match with the rest of the system (perhaps a shakeout hopper may be plugging because its conveyor does not take away enough sand). Speed it up and watch the hopper come clean and stay that way. But watch the other units down the line to make sure they too are taking care of the increased load without distress.

If designing a system, be sure there are places in it where you can either take out sand or put it in the system without terrific labor. It sometimes happens that a unit will break down, and the parts "upstream" will keep pouring on sand until some part is buried seriously before some one gets to the stop switch and shuts off the sand stream.

One such unit that proved to be a weak spot in a big sand system was an elevator. The engineer had put it in a pit some six feet deep when it could have been standing on legs six feet high equally as well. Probably he feared the belt conveyor discharging into it could

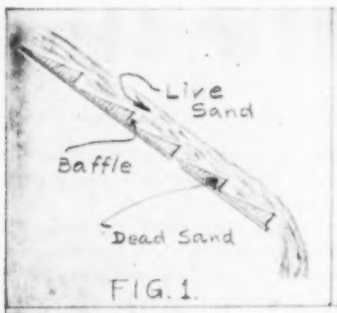

FIG. 1.

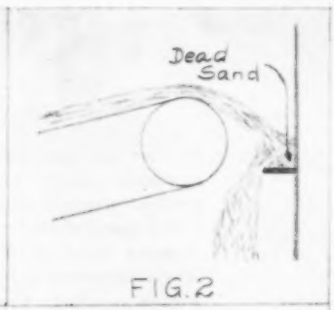

FIG. 2.

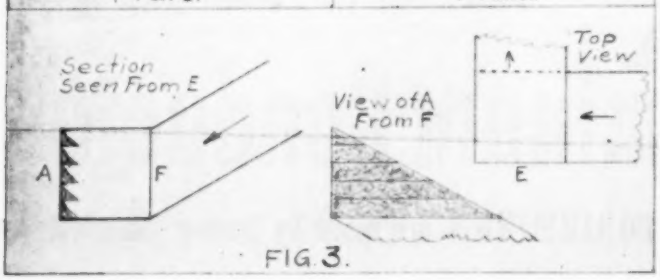

FIG. 3.

● **LOAD ON BOILER CUT BY 75 HP** by trapping with Armstrongs, says Chief Engineer of large midwestern hospital.

● **30°-40° TEMPERATURE INCREASE** on 8-roll ironer after unit trapping with Armstrongs, reports large eastern laundry.

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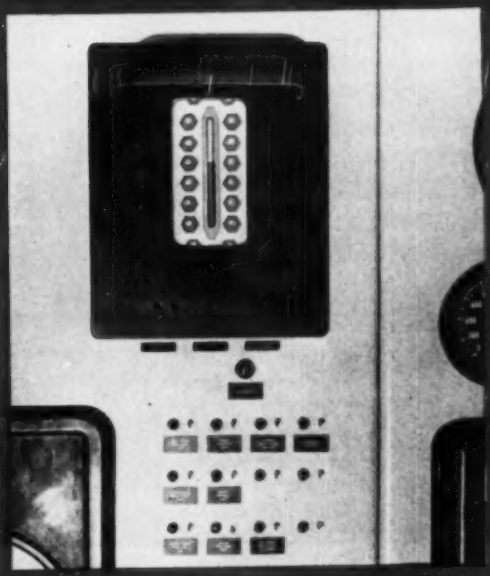
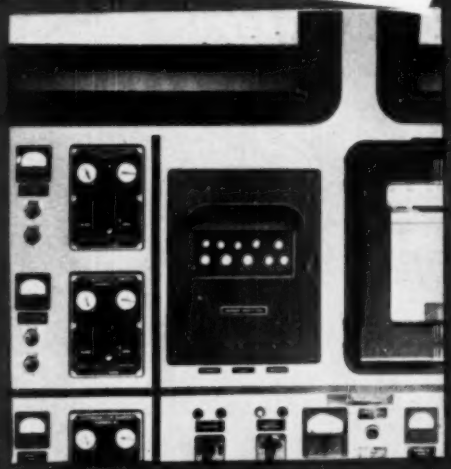
At Philip Sporn Plant two Diamond "Utiliscopes" (wired television) enable the control room operator to see for himself the exact boiler water level . . . and the condition of the 10 burner pilots in the furnace. One "Utiliscope" camera watches boiler water level; the image of the gauge shows on the viewing screen which is a part of the control panel. View-ports, which show whether burner pilots are on or off, are observed by another "Utiliscope" camera through a system of mirrors; the viewing screen on the control panel shows them as a series of 10 bright discs when all are lighted.

The "Utiliscope" is solving many problems in power plants and countless other places in industry. Wherever anything is too remote, too inaccessible, or too dangerous to observe directly, the "Utiliscope" is the answer. Ask for Bulletin 1025.



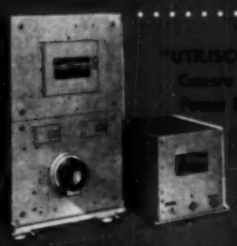
READING BOILER DRUM WATER LEVEL

The "Utiliscope" camera watches a Diamond Bi-Color Water Gauge. As indicated above, the control panel viewing screen shows a clear light and dark image which indicates water level exactly . . . changes instantly as water level changes. The "Utiliscope" provides the correct reading or no reading . . . it cannot give incorrect information.



CHECKING PILOT BURNER FLAME CONDITIONS

A "Utiliscope" camera watches the 10 burner pilot view-ports through a system of mirrors. They show on the viewing screen (which is built into control panel) as 10 bright discs. Pattern is regular, so absence of one or more discs is detected at once without searching.



"UTILISCOPE" Camera and Power Unit

The "Utiliscope" is a product of the Leonard-Farnsworth Corporation and the Diamond Power Specialty Corp. • "Utiliscope"—Registered U.S. Patent Office.

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Diamond Specialty Limited • Windsor, Ontario

not handle its load at a greater angle. He was mistaken and the results were tragic.

Every time that elevator failed, the pit filled up with sand which had to be shovelled out by hand before the mechanics could find the trouble, much less repair it. And the whole situation got to be a bad "pain in the neck" to everyone concerned, especially if the failure of the unit was not discovered promptly, before the "upstream" units buried everything under a carload of sand. Had the elevator been raised as suggested, the sand could have been cleared away quickly, repairs made and the rest of the foundry could have gone ahead while the sand spill might have been cleaned up later at less loss of production.

Dry Sand

In handling dry sand, a different technique is needed, especially in chutes where the sand speed is high over steel plates having abrupt turns. The abrasive effect is often terrific.

In one instance it wore through a ¼" steel bottom plate every three weeks. The trouble was cured in the following manner. Cross baffle plates were welded on the upper side of the plate at right angles to the sand flow and at right angles to the sheet surface. We made them out of 1 by ½" angles, merely to help the welder hold them in position, though 1 by ½" flat strips will serve as well (See Fig. 1). They were spaced so that when the sand stream piled up behind them the bottom sheet would be covered with sand clear back to the next baffle strip, so that the bottom sheet was covered with inert sand at all times and no moving sand could ever touch any steel, except where it flowed over the edges of the baffles. The result was that practically no wear occurred during the fourteen months it was observed, and similar installations are on record that have served equally without wear for four years.

Other spots can be protected in like manner. One was a vertical sheet that simply could not stand a steady discharge from an inclined belt conveyor. A shelf angle properly placed to catch a pile of sand and hold it so the discharging sand stream struck it, instead of the steel plate, cured that. (See Fig. 2). But one needs to be careful that he places the angle where it will actually do the work, or the sand may hit the sheet still and wear it out because the baffle plate is not properly sized and placed.

In a chute, where outside obstructions made it necessary to turn a high speed dry sand stream at a sharp right angle, shelf baffles placed close together on the vertical side sheet of the chute proved to be the answer. (Fig. 3). Close attention to the angle of repose when spacing the baffles, and setting them horizontal instead of following the slant of the chute, enabled a permanent series of piles of inert sand to be held in the path of the sand stream—thus protecting the steel side sheet from abrasion.

Sometimes in similar situations a thick sheet of rubber is used to protect the steel sheet from the high speed stream of abrasive sand, and will be found to wear astonishingly well. It is easier placed than several baffles, and while possibly costing more does not take such careful placing to be sure it does the work. Baffles need to be placed under close supervision as many inexperienced workmen cannot seem to understand the engineering reasons for them and will place them so carelessly as to defeat the purpose of the entire job.

Trash Boom for Intake Tunnel

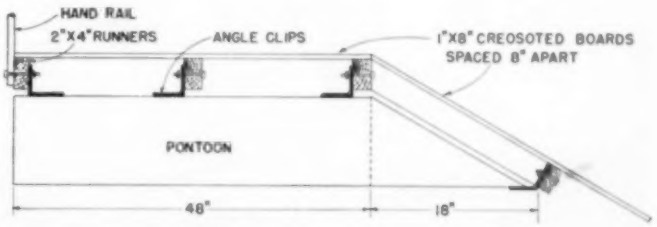
WHEN we needed a trash boom for the circulating water intake channel at a new plant we built the following:

Two floats per section were made of 18 gage black iron, welded together and pressure tested for leaks. 3" x 4" clips were welded to the floats and 2" x 4" creosoted wood runners bolted to them. 1" x 8" creosoted boards were nailed to the 2" x 4" pieces with No. 8 copper nails to make the top. The top of the pontoon was made flat for approximately 4 feet, so a wheelbarrow can be used to pick up the trash when it needs collecting. The end of the floats are pointed toward the lake side and the boards are 6" under the surface of the lake. The boards can easily be cleaned with a common garden rake and the trash put on the wheelbarrow to be removed.

We made the pontoons in 14' sections with provisions for bolting any number needed together with a steel plate 4" wide, 12" long and ¼" thick on the end of each 2" x 4" board.

The pontoon is suspended from the bank with cables and can rise and fall with the lake level. A hand rail extends 4 feet above the pontoon top and is on the side toward the plant. This was made of 1¼" pipe. The handrail was put on for use when the lake is rough.

L. B. McGEE (LA.)



NEWS
FOR SOUTHERN INDUSTRY

Tube Turns, Inc.—Tulsa

TUBE TURNS, INC., Louisville, Ky., has announced the addition of LANDIS O. MORRIS, JR., to the staff of ROBERT S. TYLER, JR., of the Tulsa, Okla., office. Mr. Morris joined Tube Turns, Inc., in July, 1949, and has completed the company's sales training program.

Bailey Meter Assigns Engineers

BAILEY METER COMPANY, Cleveland, Ohio, manufacturer of industrial instruments and controls, has announced an expansion of its staff of engineers. Included in the new assignments, is R. L. HART, who has assumed duties at the Kansas City office.

Product Engineering Department for Atlantic Steel

In response to the marked growth of metalworking industries throughout the South, and to increased demand for diversification of its own products, the ATLANTIC STEEL COMPANY, Atlanta, Ga., has announced the formation of a Product Engineering Department.

R. S. LYNCH, President of the company, defined the objectives of the unit as including:

(1) Arousing of consumer interest and stimulation of sales so as to hold or increase the company's share of existing markets.

(2) Utilization of idle production and sales facilities through opening of new markets.

(3) Diversification of product lines so as to reduce seasonal and long-term fluctuations in production and sales.

(4) Direct services to Atlantic Steel customers as well as to other metal consumers and fabricators in the form of free consulting-type assistance in such areas as product design, plant layout, fabrication problems, metallurgical problems, market surveys and analysis and other similar manufacturing and marketing problems.

Mr. Lynch identified F. A. TEEPLE, JR., as Manager of the Product Engineering Department. Teeple, with Atlantic Steel since 1934, has had a broad background and extensive experience in the metals fabrication field both as design engineer and in important operating and executive capacities. Prior to his new position he served as Superintendent of Atlantic Steel's Manufactured Products Division. He is a graduate of Georgia Tech in Mechanical Engineering.

Mr. Teeple will have a supporting staff of metallurgical and product engineers composed of FRED O. REESE, EMMETT R. RUSHIN, LAWRENCE A. WALLACE and MICHAEL F. WIEDL, JR.

F. O. REESE, metallurgical engineer, has had some seventeen years experience in various types of metal manufacturing operations. He is an authority on the uses and treatment of stainless, alloy and carbon steels and has specialized in their manufacture and development with Atlantic Steel Company, as well as with several other large firms in the steel industry. He is a graduate of Virginia Polytechnic Institute.

E. R. RUSHIN is a former consultant to management in the specialized

Product Engineering Department
Atlantic Steel Co.
M. F. Wiedl, Jr.
F. A. Teeple, Jr.
E. R. Rushin
F. O. Reese
L. A. Wallace

FUTURE EVENTS
Of Engineering Interest

THE INSTRUMENT SOCIETY OF AMERICA, Sec'y, 921 Ridge Ave., Pittsburgh 12, Pa.
Sept. 18-22, Fifth National Instrument Conference and Exhibit, Memorial Auditorium, Buffalo, N. Y.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Sec'y, 29 West 39th St., New York, N. Y.
Sept. 25-27, New Orleans Section 1950 Conference, New Orleans, La.

AMERICAN PETROLEUM INSTITUTE, Sec'y, 50 West 50th St., St., New York, N. Y.
Sept. 25-27, Petroleum Mechanical Engineering Conference, Hotel Roosevelt, New Orleans, La.

ASSOCIATION OF IRON & STEEL ENGINEERS, T. J. Ess, Managing Director, 1010 Empire Bldg., Pittsburgh 22, Pa.
Sept. 26-29, Annual Convention, Cleveland, Ohio.

GAS APPLIANCE MANUFACTURERS ASSOCIATION, Raymond C. Mayer, Publicity Director, 9 Rockefeller Plaza, New York 20, N. Y.
Oct. 2-6, Exhibition of Gas Appliance and Equipment, Auditorium, Atlantic City, N. J.

NATIONAL SAFETY COUNCIL, R. L. Forney, Gen. Sec'y, 425 N. Michigan Ave., Chicago 11, Ill.
Oct. 16-20, 38th National Safety Congress and Exposition, Chicago, Ill.

AMERICAN SOCIETY FOR METALS, Wm. H. Eisenman, 7301 Euclid Ave., Cleveland, Ohio.
Oct. 23-27, National Metal Congress and Exposition, International Amphitheatre, Chicago, Ill.

NATIONAL POWER SHOW, International Exposition Co., Grand Central Palace, New York 17, N. Y.
Nov. 27-Dec. 2, Grand Central Palace, New York, N. Y.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, M. C. Turpin, Sec'y, 40 West 40th St., New York 18, N. Y.
Dec. 3-6, Annual Convention, Hotel Commodore, New York, N. Y.

Mr. Insulation says:

To be successful an insulation job must be properly engineered. In addition, it must have these two important ingredients:

1... THE RIGHT MATERIALS: service conditions vary greatly in industrial applications. That's why no one insulation can serve as a jack-of-all-trades on all jobs. For this reason, Johns-Manville uses asbestos and many other selected raw materials to produce the most complete line of insulations available. These insulations serve applications ranging between the extreme temperatures of 400F below zero to 3000F above.

2... THE RIGHT APPLICATION: Here again Johns-Manville's long experience in the field of insulation can be of value to you. Insulation engineering advice plus the services of insulation contractors trained in Johns-Manville methods of correct application are at your call.

If you are planning an insulation job why not put your problem up to insulation headquarters? Write Johns-Manville, Box 290, New York 16, N. Y.

JM

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areas of sales and marketing; general organization and administration problems; and public and employee relations. His fifteen years experience in these fields has been divided between the petroleum products industry, private consulting practice and the Atlantic Steel Company. During his service with Atlantic he has concentrated on the application and use of steel products in the farm equipment manufacturing industry. He is a graduate of Princeton University.

L. A. WALLACE is a chemical engineer with thirty-eight years experience in steel production gathered from several of the most outstanding firms in the industry. Thoroughly trained in blast furnace and open hearth processes, he has in recent years applied his basic steelmaking knowledge to design and development of Atlantic Steel products. His career with Atlantic began in 1919. He is a graduate of the University of Pennsylvania.

M. F. WIEDL, JR., has had substantial laboratory and operating experience in the metalworking field as well as experience with the development of trade shows and trade promotion campaigns for Southern industry in general. He is a specialist in trade promotion activities and, prior to the formation of the new department, was engaged in sales development work with Atlantic Steel. He is a graduate of the University of Notre Dame.

◆

Butterfield to Head Division of Manning, Maxwell & Moore

CHESTER H. BUTTERFIELD, vice president of MANNING, MAXWELL & MOORE, INC., has been named vice president in charge of the Consolidated-Ashcroft-Hancock Division, makers of valves, gauges and industrial instruments.

C. H. Butterfield

Mr. Butterfield succeeds Hamilton Merrill, who was recently elected president of the company.

The division operates plants in Bridgeport, and Stratford, Conn., Watertown, Mass., Jersey City, N. J., and Tulsa, Okla.

Southern Chain—Birmingham

Appointment of PHILIP O. MULLANE, JR., as district sales manager of THE SOUTHERN CHAIN & MFG. CO., BIRMINGHAM, was announced recently by A. J. WILLINGHAM, JR., general manager.

Philip O. Mullane

Mr. Mullane will make his headquarters in COLUMBIA, S. C. His sales territory includes NORTH CAROLINA, SOUTH CAROLINA, and the eastern sections of TENNESSEE and GEORGIA. He will represent the company in the sale of all types of chain. Southern Chain is a Round Associate Chain Company. Mr. Mullane is a mechanical engineering graduate of Alabama Polytechnic Institute.

◆

Power Show to Present New Developments

New developments in the vastly important field of power will be comprehensively presented at the 19TH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING in Grand Central Palace, New York, November 27 to December 2. The Power Show will be held under the auspices of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in conjunction with the Society's annual meeting at that time.

Industrial executives and power plant operators visiting the Exposition will have opportunity to see the newest products—all under one roof—and observing them in operation. They will be in contact with thousands of engineers and others in a position to help them with problems looking toward obtaining greater plant efficiency, lower production costs and other items affecting their business.

The exposition is under the management of the International Exposition Company, of which Charles F. Roth, manager of the exposition, is president. E. K. Stevens, associate manager, has been active in exposition management for many years.

Watson Superintendent CP&L New Plant

Appointment of C. A. WATSON of Moncure, N. C., as superintendent of the new 200,000 horsepower steam electric generating plant at GOLDSBORO has been announced by R. S. Talton, production engineer of the CAROLINA POWER & LIGHT COMPANY.

Until his new assignment, Watson had been assistant superintendent at CP&L's Cape Fear steam electric plant. His new position will put him in charge of the largest production unit in the company's system.

Watson completed an extension course in power plant work at State College and in 1925 went with Carolina Power & Light Company as a boiler room oiler. He has successively been a boiler tender, fireman, laboratory worker, switch board operator, operating foreman and superintendent's assistant.

Watson will divide his time among the Cape Fear Plant, the general offices in Raleigh, and Goldsboro. The Goldsboro plant's first 100,000 horsepower turbine is expected to get into production by mid-1951 with a second unit already on order.

◆

Lastinger President Georgia Power & Light Co.

The board of directors of GEORGIA POWER AND LIGHT COMPANY announce the election of JOHN W. LASTINGER as president. He succeeds J. F. Bailey who has resigned. Lastinger is a former vice president and has been with the Georgia utility since 1926.

J. W. Lastinger

C. W. WARNER, former general superintendent of the company was named a vice president and director.

Both men will continue to make their headquarters at Valdosta, Ga.

Georgia Power and Light company is a wholly-owned subsidiary of the Florida Power corporation.

SPECIFY Ernst

SIGHT FLOW INDICATORS

for insertion into pipelines

"See what's going on"... inside

Fig. 17-28
Tubular Glass Type

Fig. E-811
Flapper Type
Single Window

Fig. E-57
Bulls Eye Type
Double Window

LEAKLESS TRY COCKS

Designed for 450-650-1500-2500 lbs.

Fig. 13
Ernst Leakless Try Cocks Assure Maximum Safety

Weighted Type Try Cock

Fig. 15
250 lb. Pressure, Bronze, with Iron Weight Double Chain Pull

Fig. 01
Bronze, with Wheel

Spring Type
Fig. AS-250

Fig. 5
Standard vertical bronze water gage, 350 pound design, heavier construction up to 450 lbs. Stainless and forged steel for higher pressures.

Fig. 8
All iron gages for pressure up to 250 lbs., heavier construction up to 350 lbs. Fig. 8SS—Some fittings made in stainless steel.

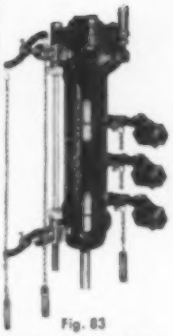

Fig. 83
No. 5 high and low alarm column with vertical gages and DCP weighted type try cocks.

SPLIT-GLAND TYPE WATER GAGE

Fig. 1
DESIGNED FOR 250-450-650 LBS. W.S.P.
High and Low Alarm Column Equipped with Split-Gland Type Adjustable Inclined Water Gage

NO GAGE GLASS PACKING NUTS

Simple and easy to install a gage glass. No wrenches or tools required. A turn of the handwheel compresses the packing.

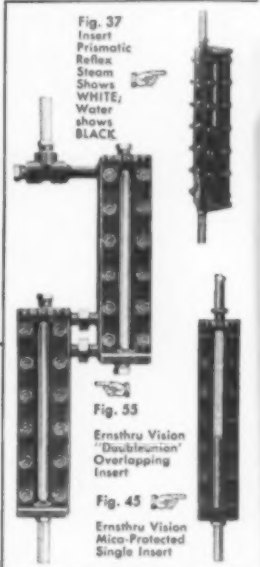
Fig. 37
Insert Prismatic Reflex Steam Shows WHITE; Water shows BLACK
Fig. 55
Ernsthru Vision "Doublreunion" Overlapping Insert
Fig. 45
Ernsthru Vision Mica-Protected Single Insert

SPECIFY Ernst

Fig. 31
Ernst Plastic Guard Replaceable Plates

Fig. 10
Plain Sight Illuminator

GAGE GLASSES—Tubular and Flat Type

Flat Type Reflex and Clear

Clear and Red-Line Magnifying Type

High Pressure Composition RUBBER GASKETS

Manufactured in all sizes to fit your water gages

Specify:
B—Inside Diameter
A—Outside Diameter
C—Thickness

Fig. 21—Lip Mold Rubber Gasket

Fig. 22—Standard Rubber Gasket

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CHICAGO: A. J. Foley Co., 7309 East End Ave., Tel. Fairfax 4-0914
CINCINNATI: A. A. Berrs Co., 1710 Central Parkway, Tel. Main 0148
CLEVELAND: Thomas V. Sords, 800 Marshall Bldg., Tel. Cherry 7330
DETROIT: J. K. Fortune & Son, 1033 Penobscot Bldg., Tel. Woodward 1-1274
HOUSTON: Esch-Condit, Inc., 103 Fonwood, Tel. Yukon 3357
INDIANAPOLIS: Kister Eng. Co., 238 Meridian St., Tel. Riley 8784
LOS ANGELES: Guy L. Warden & Sons, 209 West 12th St., Tel. Prospect 8731, Richmond 7-0541
LOUISVILLE: George Parnson, 2137 Winston Ave., Tel. Cherokee 3042
MILWAUKEE: Steam Plant Equipment Co., 4433 W. North Ave., Tel. Kilbourn 8210
MINNEAPOLIS: Albert C. Price Co., 257 Fourth Ave. South, Tel. Main 3551-3552
NASHVILLE: Power Specialty Co., 463 Chestnut St. Tel. 6-1228
NEWARK, N. J.: MacDonald Sales & Eng. Co., 143 Broadway, Tel. Humboldt 2-1559
NEW LONDON, CONN: J. H. Leatherbee, 245 Ledyard St., Tel. New London 2-1456
NEW YORK: Stanley Sales Co., 1440 Broadway, Tel. Penna. 6-0277, Longacre 5-6745
OKLAHOMA CITY: Federal Supply Co., 120 East Main St., Tel. 5-7301
PHILADELPHIA: Wm. A. Krebs, 1443 Land Title Bldg., Tel. Locust 3023
RICHMOND: Russell R. MacDonald Co., 603 Atlantic Life Bldg., Tel. Richmond 3-1247
SALT LAKE CITY: C. H. Spencer & Co., 1421 S. Main St., Tel. 6-8683
SAN FRANCISCO: Hickman Eng. Co., 420 Market St., Tel. Garfield 1-5865
SPOKANE: Pollard Co., South 121 Madison St., Tel. Main 5285
TAMPA: John D. Homan, 714 South New Orleans Ave., Tel. H 24-523
WILMINGTON, DEL.: Marvin T. Rodney, Tel. 6-1158

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This True Ball Joint Makes the Difference

Careful Special Grinding of the seats ensures that every Dart has a joint with true-bearing surfaces. The reason you always get a snug fit and a drop-tight joint with Darts.

Bronze to Bronze. To ensure permanency . . . longer service, *both* seats are made of non-corroding bronze.

Body and Nut are made of high-test, air-refined malleable iron... practically indestructible. Another one of the reasons why you get longer, better service from Darts.

Always specify Dart when you want a union you can depend on.

E. M. DART MFG. CO.
Providence 5, Rhode Island

DART UNIONS

A. P. Green Fire Brick—Texas

The A. P. GREEN FIRE BRICK COMPANY, MEXICO, MISSOURI, has recently announced the appointment of C. J. YAEGER as District Sales Manager and Sales Engineer for the TEXAS territory.

Mr. Yaeger, prior to his new appointment, was for three years Sales Office Manager of the Green Company's general offices in Mexico, Missouri.

Since receiving his degree in engineering, he has had 12 years' experience in the sale and application of refractory products. Mr. Yaeger is familiar with engineering problems involved in the installation of refractories in all types of industrial equipment. His office will be located in HOUSTON.

◆

Purchasing Agents Install Pitts

ROY W. PITTS, Purchasing Agent for the ATLANTIC STEEL COMPANY, Atlanta, was installed as president of the PURCHASING AGENTS' ASSOCIATION OF GEORGIA at the Association meeting held in Atlanta. He succeeds C. W. Hayes of Emory University.

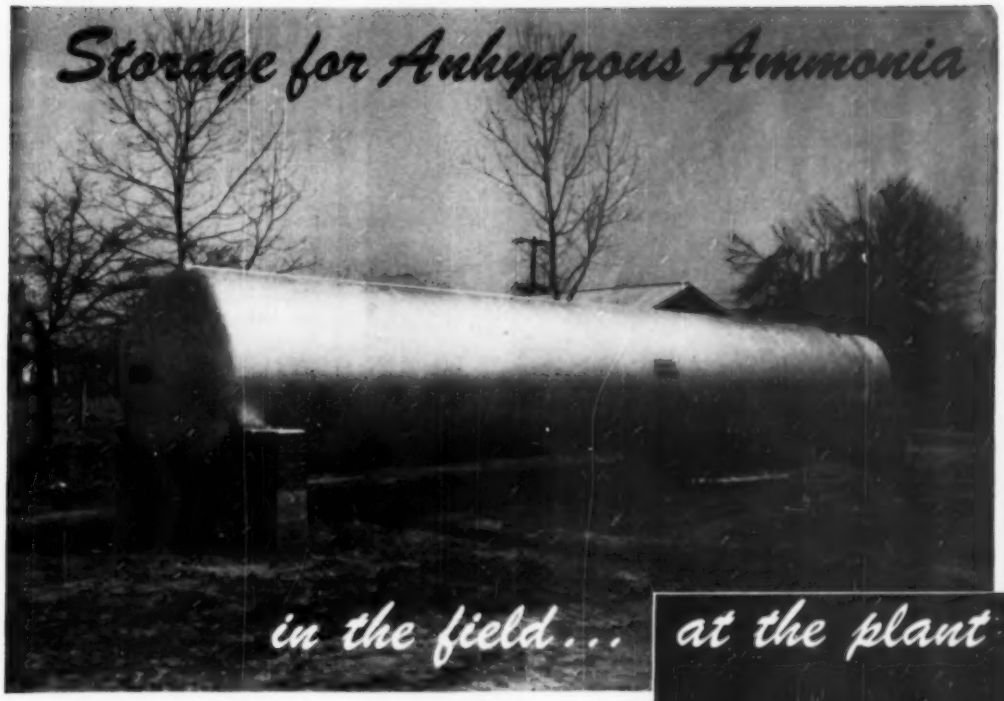
Roy W. Pitts

Connected with Atlantic Steel Company for the past 18 years, Pitts has served as purchasing agent since 1940, and was recently appointed to the Scrap Advisory Committee of the American Iron and Steel Institute.

Other Association officers are: C. H. HELD, ATLANTA ENVELOPE COMPANY and GRAHAM MITCHELL, SOUTHERN STATES EQUIPMENT COMPANY, vice-presidents; P. J. ROGERS, of Agnes Scott College is secretary and W. H. BRYANT of the NOLAND COMPANY is treasurer.

Directors of the Association are E. P. BICKERS, Columbia Baking Company; W. H. PETREE, Sockwell Company; and C. W. HAYES.

Storage for Anhydrous Ammonia



ANHYDROUS ammonia storage—whether at the plant where the chemical is made, the dealer's bulk station, or in the farmer's tanks—has one important common characteristic. It takes *pressure* to properly store and handle this amazing fertilizer that is helping farmers reap an extremely abundant harvest.

At the dealer's bulk station, anhydrous ammonia is often stored in cylindrical pressure tanks. For reasons of safety, such tanks should be built by an experienced fabricator familiar with code requirements.

We built the 30,000-gal. tank shown above to ASME specifications for a working pressure of 250 lbs. per sq. in. It is located at the Ellendale, Tennessee, bulk plant of J. G. Appling & Son. The supply of ammonia stored in this tank is transferred to truck or trailer tanks for farm deliveries.

Back at the producing plant, large capacity units generally provide the most economical storage. A Hortonsphere usually costs less per gallon of storage than several horizontal tanks. Furthermore, it requires less ground space and needs only *one* set of pipe connections and fittings. The 15,000 bbl. (630,000 gal.) Hortonsphere shown at the right is used to store anhydrous ammonia at a chemical plant in Louisiana.

Cylindrical pressure tanks are widely used for storing highly volatile liquids and gases like propane, hydrogen, oxygen, etc. The Hortonsphere is usually installed to store butane, the more volatile grades of natural gasoline, or volatile refinery charging stocks. It has also been used to store isoprene, isobutylene, sulfur dioxide, and carbon monoxide. Whenever you need pressure storage tanks or other steel plate structures, let our nearest office furnish estimates and quotations.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3.....2180 Healey Bldg.
Birmingham 1.....1531 North Fiftieth St.
Boston 10.....1044—201 Devonshire St.
Chicago 4.....2107 McCormick Bldg.
Cleveland 15.....2218 Guildhall Bldg.
Detroit 26.....1934 Lafayette Bldg.
Houston 2.....2132 National Standard Bldg.
Havana.....402 Abreu Bldg.
Los Angeles 17.....1545 General Petroleum Bldg.
New York 6.....3312—165 Broadway Bldg.
Philadelphia 3.....1646—1700 Walnut St. Bldg.
Salt Lake City 4.....545 West 17th South St.
San Francisco 4.....1531—200 Bush St.
Seattle 1.....1345 Henry Bldg.
Tulsa 3.....1628 Hunt Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY, and GREENVILLE, PA. In Canada—HORTON STEEL WORKS, LIMITED, PORT ERIE, ONT.

THEY *seal better... last longer...*

BELMONT SHEET PACKINGS

Wherever flange and parallel surface joints must be connected for long trouble-free service — always select Belmont, the Better Sealing . . . longer lasting Sheet Packings. Long experience has made sheet packing manufacture a SPECIALTY with Belmont, that's why Belmont Sheet Packings are selected for every temperature . . . every pressure . . . every conceivable type of service.

You can get standard Belmont Sheet Packings — made of compressed asbestos, asbestos metallic, red rubber, cloth inserted, vegetable fibre and a wide range of other constructions. However, whether you require standard or special sheet packing, remember — you always get better sealing . . . longer life with Belmont.

CUT YOUR OWN GASKETS WITH A BELMONT GASKET CUTTER

A portable tool for cutting 1¼" dia. to 19" dia. circular gaskets from all kinds of soft sheet packings. Rigid and simple to operate. Larger sizes only require cutter bar replacement.

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There's a Belmont Packing for every service

Rings · Spirals · Coils · Reels
Spools · Sheets · Gaskets

Steam · Water · Oil · Gas · Air
Acids · Alkalies · Ammonia

Jeffrey—West Virginia

The JEFFREY MANUFACTURING COMPANY, Columbus, Ohio (Mining, Material Handling and Processing Equipment), recently announced the removal of its district office in WEST VIRGINIA from Huntington to 403 City Avenue—BECKLEY. MR. E. C. HEBDEN is manager and will continue to serve both the Industrial and Mining fields in that territory.

◆

Joel B. Gibson Promoted By Southern States

JOEL B. GIBSON has been promoted to Assistant to the President of SOUTHERN STATES IRON ROOFING COMPANY, Savannah, Georgia. He was Chief Engineer.

The recent announcement by Frank O. Wahlstrom, president of the company, stated that this is a newly created position to effect better control in an anticipated expansion program of the company and in the development of new products.

Joel B. Gibson

Gibson will also work with the president in coordinating the efforts of Southern States and Reynolds Metals Company to promote the distribution of aluminum building products in the South.

A native of Ohio County, West Virginia, Gibson joined Southern States in 1943 as sales engineer, working primarily on the company's prefabricated building program for the Armed Forces. Since that time he has served in both engineering and sales capacities. He became chief engineer in October, 1947.

At one time Gibson was chief engineer for the Pennsylvania State Aeronautics Commission. Later he became assistant director of the Construction Division, Resettlement Administration in Washington, D. C. Immediately prior to going with Southern States he was sales engineer with the Tennessee, Coal, Iron & Railroad Company.

The exteriors may look alike— but *what a difference inside!*

Inside one home, life goes on smoothly and harmoniously. But in the house next door there's constant friction and nerve-wearing turmoil.

Compare the outside appearance of any standard Powell valve with that of any other valve of the same type and size. You will probably notice very little difference. But inside—that's another story.

There design, materials and manufacturing skills make the difference between a Powell Valve—built to operate smoothly and efficiently over a long period of time—and a valve that will have only a short life before it requires maintenance or even replacement.

Powell also makes many *exclusive* patterns to meet the requirements of special services. In these, too, long trouble-free performance is a primary consideration.

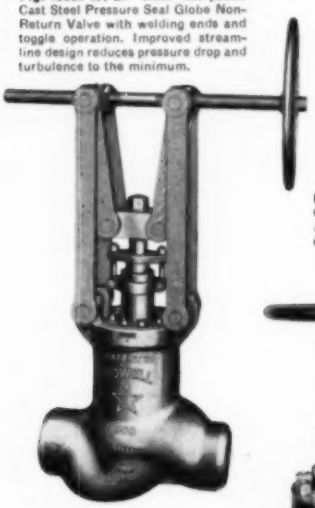


Fig. 19084 W. E.—Class 900-pound Cast Steel Pressure Seal Globe Non-Return Valve with welding ends and toggle operation. Improved streamline design reduces pressure drop and turbulence to the minimum.

Fig. 1333-A — 1500 pound Cast Steel Integral Bonnet Angle Valve. Also available in Globe and "Y" types.

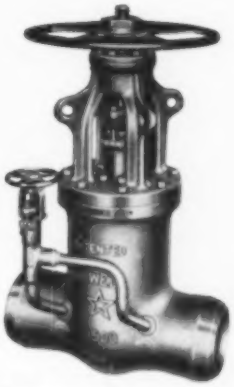


Fig. 11313 W. E.—Class 1500-pound Cast Steel Pressure Seal Gate Valve with welding ends and by-pass. By-pass is equipped with 1500-pound Integral Bonnet Steel Angle Valve.

Fig. 1793.—Large 125-pound Iron Body Bronze Mounted Gate Valve with outside screw rising stem, bolted flanged yoke, tapered solid wedge.

Fig. 2608—Bronze Globe Throttling Valve. Full flow through the seat when wide open. Has special bronze stem and stainless steel disc and seat hardened to approx. 500 Brinell.

Fig. 1365-A — Small size, 1500-pound, Steel Pressure Seal "Y" Check Valve. Angle Lift Check Valves also available.

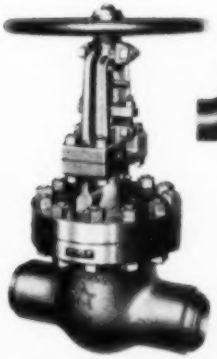


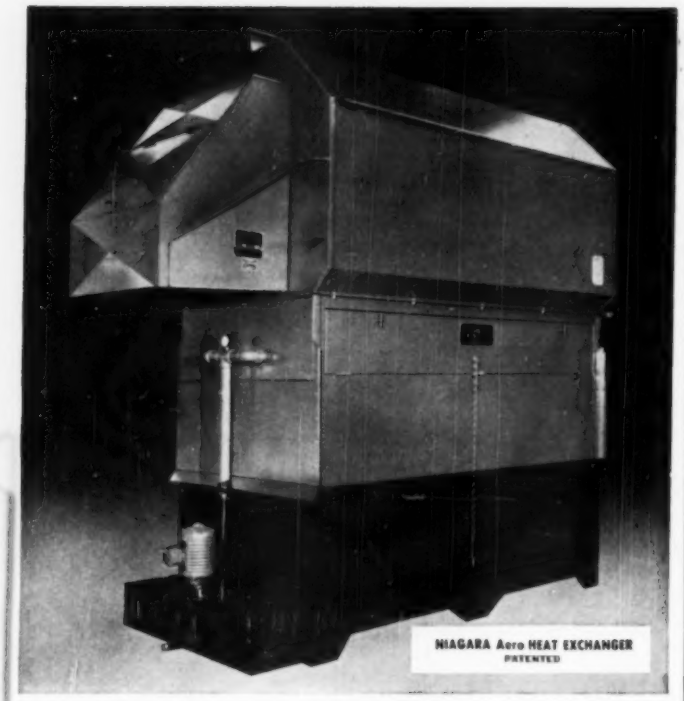
Fig. 9003 W. E.—Class 900-pound Cast Steel Gate Valve. Welding ends, outside screw rising stem, bolted flanged yoke, tapered solid wedge.

The Complete Powell Line includes Globe, Angle, "Y", Gate, Check, Non-return, Relief, and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-resistant metals and alloys.

Ask your nearest Distributor—or write direct

The WM. POWELL Co., 2525 Spring Grove Ave.
P. O. Box 106, Station B, Cincinnati 22, Ohio
DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES



SAVE COOLING WATER

Get Many Other Benefits and Cost Savings

• Niagara Aero Heat Exchangers provide faster and more accurate cooling to specified temperatures for liquids in many industrial processes. They help lower production costs.

Cooling by the evaporative principle, they transfer heat to air, which is easily disposed of, and consume less than 5% of water used in conventional cooling methods. A Niagara Aero Heat Exchanger replaces both shell-and-tube cooler and cooling tower, and saves piping and pumping. Its savings quickly return its cost.

It helps improve the quality of production by removing heat at the rate of in-put, and by greater accuracy of control. For example, as applied to heat-treat quenching or to a chemical process cooling, provision for heating as well as cooling saves the time and prevents the product losses of a "warm-up" period.

Successful applications also include control of temperatures for jacket coolants for engines, hydraulic equipment, transformers and electronic sets, and special industrial equipment.

Write for Bulletin No. 96

NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

Dept. SP 405 Lexington Ave., New York 17, N. Y.

Atlanta Office: Crawley-Gorbandt Co., 118 W. Peachtree Pl. N. W.

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

Dampney Company Expands

The DAMPNEY COMPANY OF AMERICA, Hyde Park, Boston 36, Massachusetts, announces expansion of its industrial sales representation with appointment of three new agents to handle its line of specialized protective coatings for the maintenance of metal. BOILER SUPPLY COMPANY, 440 Chestnut Street, NASHVILLE, will cover TENNESSEE, and R. E. MUNDY COMPANY, 1520 Cleveland, S. W., ROANOKE, Central VIRGINIA and Southern WEST VIRGINIA.

◆

Florida Power Promotions

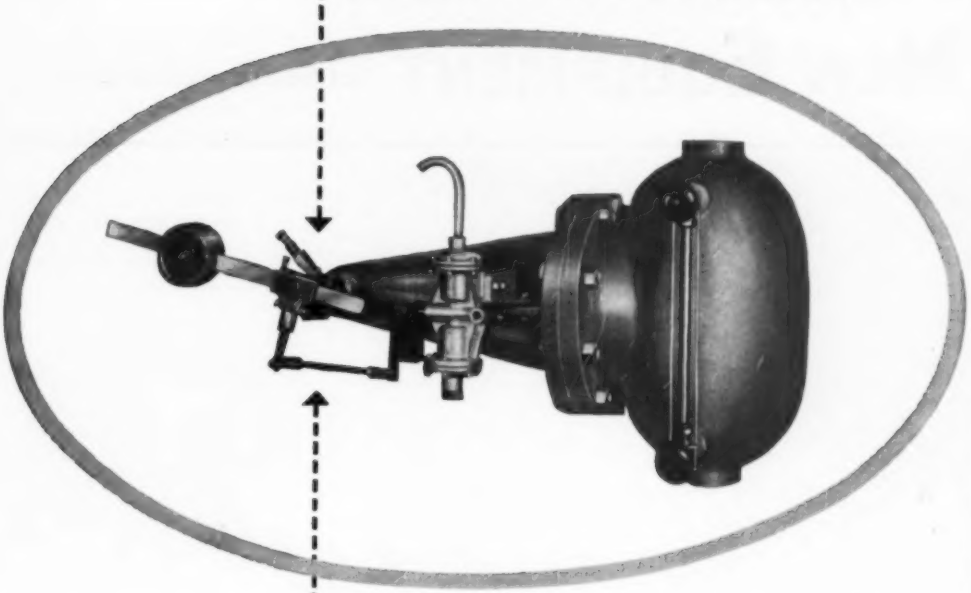
W. C. GILMAN, president, FLORIDA POWER CORPORATION, has announced that ALEX SPEER, director of public utilities for the City of St. Petersburg, has been named Assistant to the President.

W. J. Clapp

Other changes in the executive staff of the company were: election of W. J. CLAPP as vice president in charge of operating departments; W. W. WOLFF as vice president in charge of divisions, and D. B. HYER, JR., becomes commercial manager in charge of the Industrial, Residential and Commercial sales departments.

Speer first came to St. Petersburg in 1928 as executive vice president of Florida Power, and was president when he resigned to go to Alexandria, Va., in 1937 to become president of the Virginia Public Service company, where he remained for three years. He then became chief engineer of the power division of the department of interior in Washington for two years with the trustees of the Associated Gas & Electric Company. In 1944 he returned to St. Petersburg as head of the post war plans division of the city and later became director of the Utilities division.

INSTALL IT AND FORGET IT!



For Economical and Dependable Liquid Level Control

...THE HONEYWELL FLOAT CAGE

USER reports show up to ten years of accurate, dependable service . . . on surge tanks, feedwater heaters, evaporators, deaerating tanks, stills and other process equipment! This eliminates one troublesome maintenance problem . . . and, at the same time, assures the continuity of service that leads to greater processing efficiency.

Honeywell Float Cages are supplied either with direct connection for mechanical operation, or with on-off or throttling type pilot valve for pneumatic operation. In addition, the Honeywell line includes internal float type level controllers for use where vessel design and conditions permit.

Honeywell Float Cages are available in Bronze, Cast Iron, or Cast Steel . . . with Bronze, Stainless Steel or Special Alloy trim. Float sizes—6", 8" and 10".

Call in your local Honeywell engineer for detailed information about these float cages and such other Honeywell Control Specialties as Hi-Lift Hand Control Valves, Non-Lubricated Cylindrical Plug Valves, Transfer Valves, and the Honeywell Space-Saving Bypass.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1902 Windrim Avenue, Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

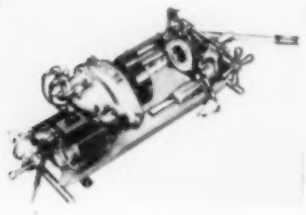
COMMERCIAL • RESIDENTIAL • INDUSTRIAL
WORLD'S LARGEST ORGANIZATION FOR ADVANCED INSTRUMENTATION AND CONTROL

MINNEAPOLIS
Honeywell
VALVE PRODUCTS

NEW EQUIPMENT for Southern Industry

Pipe and Bolt Machine

K-1 BEAVER PIPE TOOLS, INC., Warren, Ohio, announces its new economy model pipe and bolt machine, a 185 pound power tool for cutting and threading pipe, bolts, and conduit. The unit has a total capacity up to 8 inches, is lever fed and smooth operating. An outboard eccentric spool steady-rest prevents "whip" of long lengths of overhanging revolving pipe from rocking the spindle.

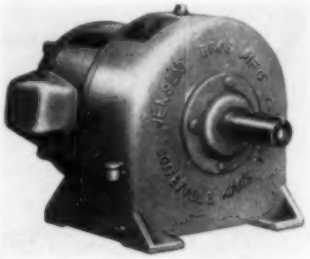


The new model uses the same die heads, the same dies, the same patented interchangeable wheel-and-roller or knife cutoff devices, the same reamer arm and cone, as the company's other models. The machine is useful on jobs requiring extreme portability.

Free additional information is available to readers of Southern Power & Industry. Check item code number on the postage free service coupon post card provided on p. 17.

Speed Reducer

K-3 JENSEN BROTHERS MFG. CO., Coffeyville, Kansas, announce the availability of a planetary gear speed reducer. The

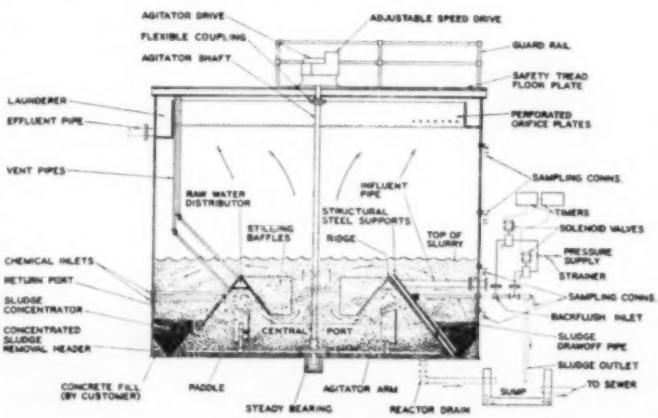


unit, named the GeartorK, consists of a system of planetary gears mounted in a heavy duty frame. The electric motor is bolted directly to this frame. The speed reducer and motor make a compact, easily mounted unit. The unit is available in sizes from ½ to 10 hp. Flange mounted models have been developed for special applications.

Sludge Contact Reactor

K-2 COCHRANE CORPORATION, 17th St. below Allegheny Ave., Philadelphia 32, Pa., has announced a new sludge contact reactor that operates on the old chemical laboratory principle that previously formed precipitates added in the form of sludge or slurry will accelerate chemical reactions.

This Cochrane-Liquon Sludge Contact Reactor is designed for such services as: clarification of surface water for removal of suspended solids, turbidity, color, taste and odor for industrial municipal purposes; lime or lime-soda softening of any hard water for municipal or industrial application; clarification and/or softening surface and well waters for make-up to cooling towers, spray ponds, etc.; coagulation and reduction of alkalinity of surface or well waters as a pretreatment ahead of ion exchange or hot process softeners for boiler feed; removal of silica from water by absorption in contact with ferric hydroxide or magnesium oxide or hydroxides in the sludge to avoid silica deposits in boilers and steam turbines; removal of fluorides by absorption in contact with magnesium hydroxides in the sludge; clarification and de-alkalization of water used for production of carbonate beverages; removal of alkalinity from water used in manufacture of raw-water ice; iron and manganese removal from well waters; separation of fibre stock and filter from white water in paper mills; waste water treatment in general to reduce pollution of streams.



High Pressure Reducing Valve

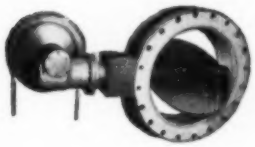
K-4 THE ATLAS VALVE COMPANY, 282 South St., Newark 2, N. J., have announced an improved high pressure reducing valve for working pressures as high as 6,000 lb per sq in. It is claimed that pressures as high as this are handled without shock. The valve is known as their Type "E" High Pressure Reducing valve. It is recommended for reducing the pressure of water, oil, and compressed air—in a single stage to 250 lb per sq in. or to within 20 per cent of the initial pressure. For lower reduced pressures the reduction should be made in two stages.

The body of this Type "E" valve is forged steel. The internal metal parts are entirely of hard chromium plated stainless steel. The one piece seat stem and removable seat are easily reground and replaced. The plastic cup piston washers are specially made to suit the high pressure service. The pressure on the seat is balanced by a piston above, consequently variations in initial pressure have little effect on the reduced pressure. A formed packing of special material superior to leather has been adopted which is immune not only to water but to oil and other fluids commonly used in hydraulic machinery. By means of the hand-wheel at the top adjustments can be easily and quickly made.

◆

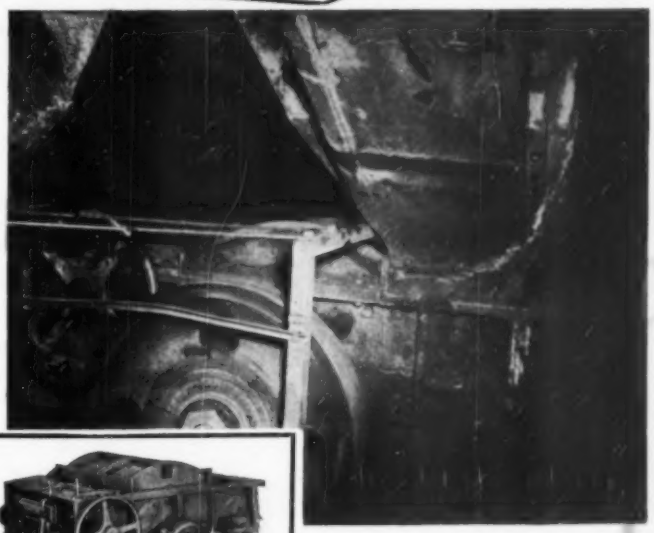
Rubber-Lined Valve

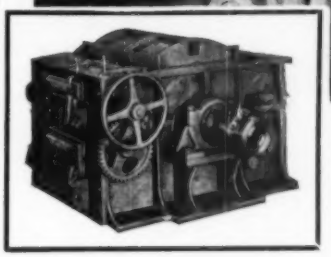
K-5 R-S PRODUCTS CORPORATION, Wayne Junction, Philadelphia 44, Pa., has developed a 50-pound valve which can be rubber lined for resistance of erosion and abrasion in the control and tight shut-off of slurries or dry pulverent materials in air transport pipe lines.



Hard or soft natural or synthetic rubber, depending on the material to be controlled, is sealed to the valve vane as well as the valve body. This type of construction makes it possible to economize by the use of an iron valve body in service that would normally call for stainless steel or other alloy.

4 MILLION TONS OF COAL CRUSHED
with a parts replacement cost of only $.0005 per ton





AMERICAN AC3-E CRUSHER in continuous service for 10 years reduces 300 TPH 6" x 1¼" washed coal to 100% passing 1¼" screen

AT THE LITTLE SISTER COAL CORPORATION (St. David, Ill.) . . . this crusher is giving a performance that is typically American—typical because American Crushers are engineered to "take it", and are tested in actual use. They slash power and labor costs too, and cut out-of-service time to a minimum. *Here are a few construction "whys" behind American records—*

THE HEAT TREATED ALLOY STEEL MAIN ROTOR SHAFT—revolves on heavy duty Timken Bearings enclosed in dust and oil-tight pillow blocks. *Perfect balance eliminates vibration.*

THE ALL-MANGANESE STEEL CRUSHING PARTS include renewable Breaker and Grinding Plate, also Crushing Chamber Cheek Liners. Grinding Plate is adjustable to compensate for long wear.

THE HEAVY RIBBED SECTIONAL FRAME—Cast Steel—permits accessibility and adjustability . . . bearing pedestals are cast integral with side frames to assure rigidity.

REVERSIBLE SHREDDER RINGS *split coal instead of crushing it*—assure uniform, high tonnage reduction while operating at slow, power-saving speeds.

Let an American representative analyze your crushing problem. Write for details on complete line of crushers.

American PULVERIZER COMPANY
Originators and Manufacturers of Ring Crushers and Pulverizers
1243 MACKLIND AVE.
ST. LOUIS 10, MO

Self-Priming Pump

K-6 GOULDS PUMPS, INC., Seneca Falls, N. Y., has announced a new line of self-priming centrifugal pumps. New design features include elimination of all valves;

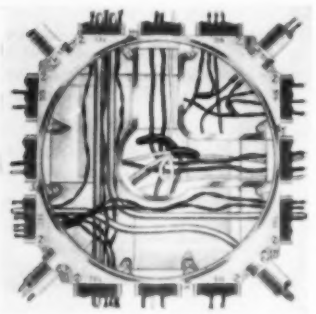
positive self-priming; no large and bulky priming reservoir; no recirculation of water during pumping stage, and efficiencies comparable to standard centrifugal pumps.

The pumps are made in sizes from ¼ hp to 5 hp, open and closed impellers; capacities to 120 gpm, and heads to 135 ft depending on capacity; suction lifts up to 25 feet.

◆

Junction Boxes

K-7 NATIONAL ELECTRIC PRODUCTS CORP., Chamber of Commerce Bldg., Pittsburgh 19, Pa., is marketing a new series of three shallow, pan-type junction boxes for "Nepcoduct" one, two or three duct underfloor wiring systems.



Designed for installation with shallow concrete slabs, open-web steel joist construction, steel decking, or cellular floors, the new boxes ocupy only 2½ in. of top floor construction.

All ducts enter on one level, with an interior design placing the low potential wiring area always at top level of the box. The boxes are provided with adjusting screws for raising lowering and levelling. Ducts and conduits are secured to these boxes by tangent bearing set screws. Galvanized steel tops are standard, but tops for marble or terrazo floor finish are available.

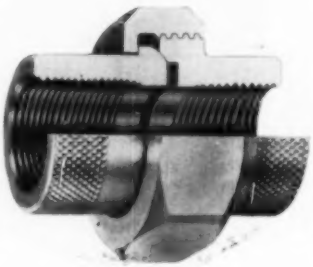
FREE READER SERVICE

To obtain free information on this equipment, circle number on the page 17 free post card.

◆

Steel Union

K-8 THE WELL EQUIPMENT MANUFACTURING CORP., 2023 Semmes Street, Houston, Texas, announce their 3,000 lb nonshock cold working pressure WECO "Junior" all-steel union in sizes ⅛-in. through 2-in.



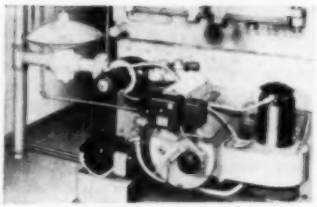
Features are: a leak-proof seal obtained by the Weco ball and cone seat; faster assembly and disassembly through Acme threads; and use of a resilient gasket which acts as a supplementary seal and protects the metal-to-metal seat against abrasion and corrosion from line fluids and gases.

Unions are packaged in corrugated board cartons of 12 and 24, depending on size. This means added protection and simplifies inventorying. Unions are available in black (machine) or Wecolyte cadmium plated finishes.

◆

Dual-Fuel Burner Unit

K-9 THE NORTH AMERICAN MFG. CO., 4455 East 71st St., Cleveland 5, Ohio, has introduced its new Flame King Series 116DF packaged boiler burner unit, which makes it possible to change from gas to oil, or vice versa, by merely throwing switches. This automatic dual-fuel unit is made in two sizes covering a range of 1½ million



to 3¾ million Btu input for industrial and commercial heating or processing boilers. It burns No. 3 oil, or lighter, and natural or mixed gases.

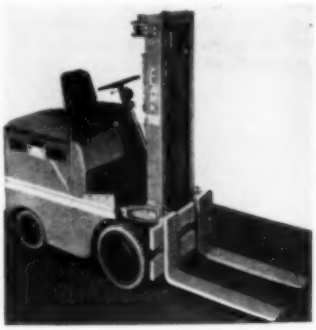
The burner is factory wired and completely assembled. It includes all electronic controls and flame safety devices. An integral blower furnishes all necessary combustion air and an electrically ignited ignition blast pilot assures positive main flame ignition. Gas regulators and oil pumping equipment are also included.

◆

Fork-Truck

K-10 CLARK EQUIPMENT COMPANY, Industrial Truck Division, Battle Creek, Mich., have announced a new 3,000 lb capacity electric Carloader fork-lift truck.

The machine, which is designed for compactness and maneuverability, has new design features including: controls to insure safety; ease of operation; automatic acceleration, providing smooth and even variations of motor speed. The acceleration is accomplished through a master power-switch regulated by an automatic timer. Driving is almost identical with that of an automobile equipped with automatic gear-shifting device.



Lift heights are available in a range from the standard 84 inches with over-all height of 61 inches with forks down, to 130 inches and an over-all height of 84 inches with forks down. Easy accessibility to vital parts facilitates service and maintenance.

Vertical Turbine Pumps

K-11 WORTHINGTON PUMP AND MACHINERY CORPORATION, Harrison, N. J., has developed a new line of vertical turbine pumps with capacities from 50 to 15,000 gpm.

Incorporated in the line are extra size bearings of special materials for long life; shaft seals where required; enclosed impellers throughout; wearing rings; flanged and bolted bowl construction.

Either oil or water lubricated pumps are available from various stock locations, arranged for motor drive, right angle gear drive, or belt drive. They are suitable for services including industrial and municipal water supply, installation in sumps, tanks, reservoirs, for pumping water, refinery products, and other liquids.

◆

Electric Tractor

K-12 AUTOMATIC TRANSPORTATION COMPANY, 149 West 87th St., Chicago, Ill., has introduced a new driver-led electric tractor, which is the second unit of the Automatic 101 line to be marketed.

The battery-powered tractor is shorter and more rugged than previous models. The power unit housing is cylindrical, which has cut five and one-half inches from the Transtractor's length, thus lowering aisle requirements and reducing the turning radius. It has a completely cast drive housing, and the battery is in a solid steel enclosure.

A new development is that the machine operates in both speeds, either forward or reverse, with the handle upright. Working parts have been simplified and reduced in number for durability and easier maintenance.

COMING SOON!

Outstanding presentation of equipment for production and utilization of steam, electric, and mechanical power—

for YOUR benefit

19th NATIONAL POWER SHOW

NATIONAL EXPOSITION OF POWER & MECHANICAL ENGINEERING

GRAND CENTRAL PALACE, N.Y.

NOV. 27 to DEC. 2

featuring:

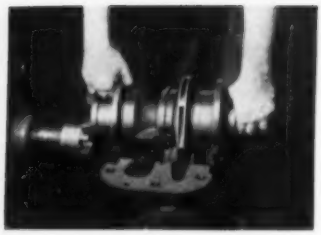
- Over 300 informative displays and interesting demonstrations of latest developments for improving power production and utilization.
- Hundreds of new cost-saving ideas on design, installation, operation, maintenance, modernization, and expansion.

Discuss your problems and future plans with exhibitors' technical experts.

Plan to Attend — You'll Be Glad You Did!

Auspices A.S.M.E. in conjunction with Annual Meeting

Management International Exposition Co.



Pump Service and Exchange Plan

K-13 De Laval Steam Turbine Company, Trenton 2, N. J., has developed a new pump designed with every working part subject to wear contained in one easily removed rotor assembly. When maintenance is necessary, the top cover and end plate studs are removed, the assembly lifted out, and a new one dropped in place. This procedure is known as the service and exchange plan.

Pump case with cover are of cast iron construction. Adoption of stainless steel for the shaft permits elimination of shaft sleeves and the reduction in shaft length between bearings results in a stiffer shaft to take care of hydraulic disturbances. Two permanently lubricated ball bearings support the shaft, one acting as a locating bearing.

The new pump is built in three sizes for capacities to 450 gpm, heads to 230 ft.

◆

Electric Lubricator

K-14 The Lincoln Engineering Company, 5702 Natural Bridge Ave., St. Louis, 20, Mo., announces a new electric lubricator known as the "Lubrigun", with pressure primer for dispensing medium and heavy grade lubricants.

These lubricators are designed and built to provide fast, efficient lubrication of industrial machinery requiring high pressure application of medium and heavy grade lubricants that will not readily seek their own levels.

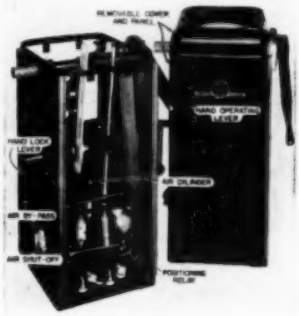
The units are equipped with a manually-operated screw-feed pressure primer, spring loaded to maintain positive and continuous prime even at low temperatures.

The lubricators are compact and portable. They are suitable for use in general high pressure lubrication in plants where compressed air is not available, or where electrically operated equipment is desired.

◆

Control Drive

K-15 Bailey Meter Company, 1050 Ivanhoe Road, Cleveland 10, Ohio, has recently developed a control drive which can be "tuned" to the requirements of a special application. This completely enclosed air-operated drive makes it possible to parallel characteristics of a driven device with characteristics of other equipment, thereby securing a unified system.



The drive consists of a double acting air cylinder (with rigid supporting stand and enclosure), a positioning relay, and a manual operating wheel or lever. The positioning relay provides the characterizing feature. It incorporates a cam whose shape determines the relation of control drive position to control loading pressure. Three interchangeable cams are included with each drive.

FREE READER SERVICE

To obtain free information on this equipment, circle number on the page 17 free post card.

Pritchard's

NEW Quintair*

AIR COOLED HEAT EXCHANGER

For Dependable, Efficient Cooling or Condensing of Liquids, Gases or Vapors

- Lower Installed Cost
- Higher Efficiency
- Fewer Parts to Assemble
- Lower Maintenance Costs
- Lower Operating Costs
- Many Industrial Uses

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Representatives in Principal Cities from Coast to Coast

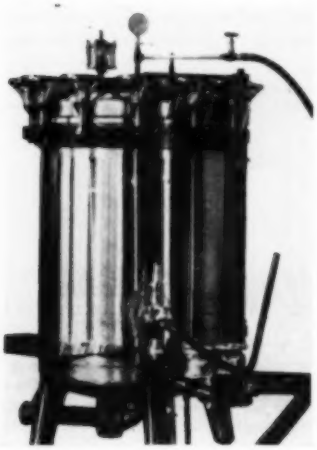
Air-Driven Drill

K-16 KELLER TOOL COMPANY, Grand Haven, Mich., is producing an air-driven drill known as the "Airfeedrill" designed to eliminate operator fatigue. The product had its beginning in a war plane plant and developed into the portable air-powered tool, which the manufacturer states will provide effortless drilling of true, straight holes on industrial jobs. Copies of new tool manual "The Hole Story of the Keller Airfeedrill" are available on request.

◆

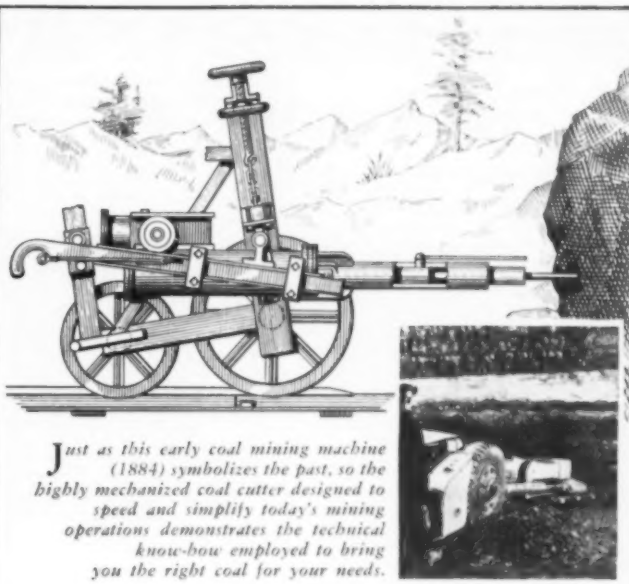
Diatomite Filters

K-17 THE ENZINGER UNION CORPORATION, Angola, New York, announce that the Enzinger diatomite filter widely used in the process, chemical, food and beverage industries, has been adapted to filtering boiler feedwater and condensate by incorporating a sluicing device which eliminates opening of the filter at any time. It is built in accordance with A.S.M.E. code from mild steel, stainless steel, or Monel.



Filter features forged stainless steel bolts with Acme threads for holding down the cover, which is mounted on a vertical hinge incorporating antifriction bearings. A mechanical toggle and lever design is used to raise the filter cover off its gasket seat without effort. Newly designed link type spacer bar for the leaves, permits quick inspection and exchange of leaves at any time.

Uniform cake thickness and complete utilization of the filtering area are obtained by feeding the unfiltered



Just as this early coal mining machine (1884) symbolizes the past, so the highly mechanized coal cutter designed to speed and simplify today's mining operations demonstrates the technical know-how employed to bring you the right coal for your needs.

SOUTHERN'S Coal Engineering

the modern approach to scientific application

Right coal selection and application to specific types of burning equipment—that's the specialized mission of Southern's coal engineers! Yes...our engineering service has kept apace of modern mining techniques. This service is of vital importance to buyers of industrial coal.

Here is Southern's modern approach to boiler-room problems: Scientific plant surveys—recommendation and selection of the most logical coal—carefully conducted actual burning tests. More often than not, the results of our surveys and tests mean big savings in coal purchases, plus maximum efficiency. One of our engineers will be glad to work with you—without obligation.

SERVICE FROM AMERICA'S LEADING COAL FIELDS—Southern offers industrial buyers a wide variety of premium coals from the coal fields of Western Kentucky, West Virginia, Virginia, Eastern Kentucky, Illinois, Alabama, Arkansas and Oklahoma. *One is right for your plant!* Write, wire or telephone the nearest Southern office for complete information.

A TESTED COAL TO MEET EVERY INDUSTRIAL REQUIREMENT

Southern Coal Company, Inc.

General Office: 333 North Michigan Avenue, Chicago 1, Ill.
Offices in: ATLANTA, BIRMINGHAM, CHARLOTTE, CHICAGO, KNOXVILLE, LOUISVILLE, MEMPHIS, NASHVILLE, ST. LOUIS
Sinclair Coal Company, Kansas City 6, Mo.—Western Representative
Boon-Strachan Coal Company, Ltd., Montreal—Canadian Representative

liquids through a baffle to the top as well as the bottom portions of the leaves. Unit is available in sizes from 24 to 560 sq ft filtering area.

◆

A-C Industrial Welders

K-18 THE HOBART BROTHERS COMPANY, Hobart Square, Troy, Ohio, has announced a complete new line of a-c transformer welders in which welding heat adjustment is accomplished electrically through an ac-dc reactor.

The transformer has conventional primary and secondary windings, plus an additional winding which supplies current through a rectifier to provide d-c current for ac-dc reactor adjustment.

The a-c winding is in series with the transformer secondary and the arc. The d-c winding takes current from the rectifier to saturate the iron of the reactor, providing fine adjustment of the welding current. A standard rectifier is used to supply power to the reactor d-c winding and uses minimum power.

A main range control provides five taps, so that the wide welding range is available without changing welding cable connections. Connection of the rheostat to the reactor circuit is through a standard plug and receptacle.

These sets can be furnished for operation on single phase, 60 cycle supply current, either 220/440 dual voltage, 440/550, or 220/440/550 volts. They can also be furnished for 50 cycles. They are available in 200, 300, 400, and 500 ampere sizes with stationary or portable mountings.

FREE READER SERVICE

To obtain free information on this equipment, circle number on the page 17 free post card.

◆

Carbide Drill

K-19 CLECO DIVISION of the REED ROLLER BIT COMPANY, P. O. Box 2119, Houston, Texas, is now producing a new carbide drill for use in the Cleco Handi-Drill. Capacities are ½" to 1", with lengths of 6", 12", and 18" available.

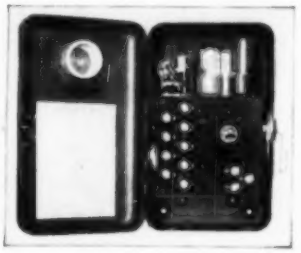
According to the manufacturer, the new drills will penetrate concrete at the rate of 5 inches per minute and have been known to drill 500 holes without resharpening.

The drill is especially adaptable to working in close quarters and for all types of masonry work.

◆

Photoelectric Control

K-20 PHOTOSWITCH INCORPORATED, 77 Broadway, Cambridge 42, Mass., is producing a new general purpose photoelectric control known as Series 20, designed for industrial and machinery application. It is available with phototube integral with the control or located in a separate housing for applications where space is limited. To make it useful in all types of safety applications, it is supplied with forward and reverse circuits so that tube replacement is indicated by either an energized or de-energized relay. Terminal panel connections provide for operation from 115 and 230 volt supply. A tamper-proof sensitivity adjustment permits positive operation over varying distance between phototube and light source.



The controls are particularly recommended for such applications as counting, conveyor control, short-range signal systems, motor or valve control, production inspection, machinery safeguards, stop-motion control in the textile, paper and wire industries, as well as specialized processes.

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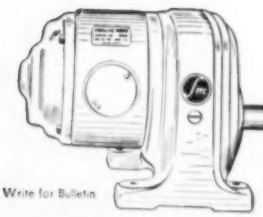

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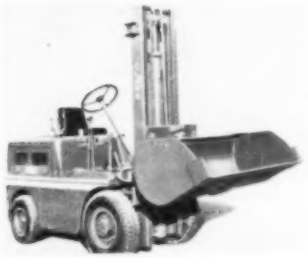
Hydraulic Shovel

K-21 CLARK EQUIPMENT COMPANY, INDUSTRIAL TRUCK DIVISION, Battle Creek, Mich., has developed a scoop shovel attachment for fork-lift trucks, designed for full hydraulic operation through the cycle of picking up a load, tilting back for carrying, dump- and return to scooping position.

The shovel is designed to handle small stampings, scrap steel, small castings, sand, gravel, stoker coal, grain, ashes, fertilizer, salt, wet mixed concrete, and other similar materials which will fall through a 2½ inch



screen. It is interchangeable with standard forks and other attachments.

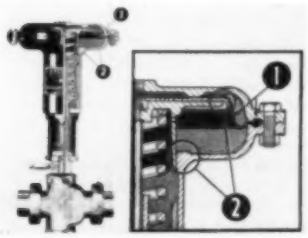
The shovel may be obtained in widths of 38 inches to 72 inches; capacities range from 8 cu ft to 15 cu ft. It can be installed on Clark gas-powered and electric battery-powered fork-lift trucks with standard rated capacities of 2,000 pounds to 7,000 pounds.

◆

Control Valve

K-22 THE POWERS REGULATOR COMPANY, 2720 Greenview Avenue, Chicago 14, Ill., has developed the "Flowrite" valve, diaphragm operated for pressure below 250 psi; sizes ¼" through 8". The valve is designed for regulating flow of steam, water, oil, or gases. It is air or water operated.

The neoprene diaphragm has posi-



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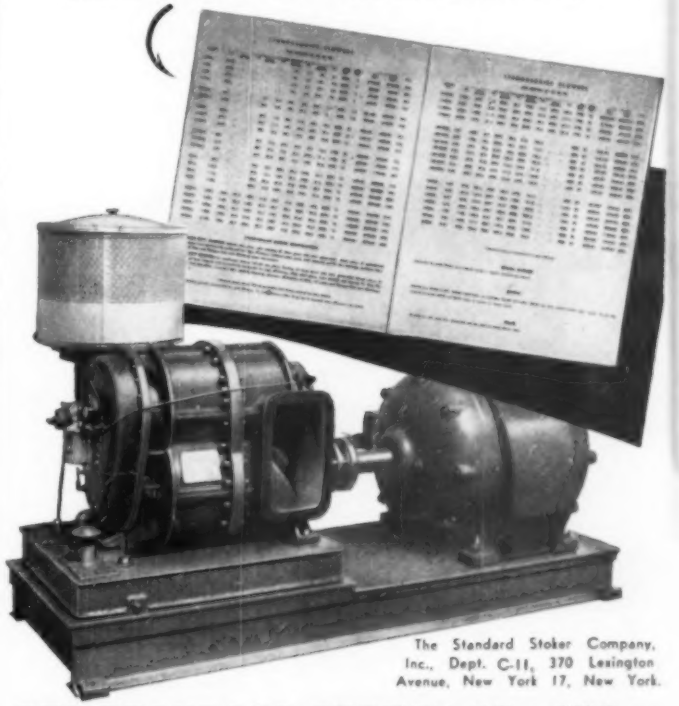

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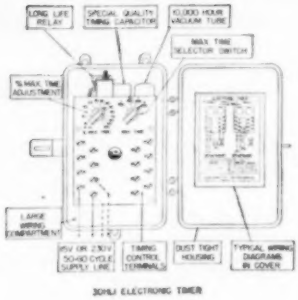
tive sealing bead which provides increased sealing action with increasing control pressure. Piston plate assembly has a free floating thrust plate which absorbs side thrust. Adjusting screw is ball bearing non-rising type. The valve is available in a variety of bodies including single or double seat, double unions and flanged ends, direct and reverse acting and 3-way valves. The trim is stainless steel and bronze.

◆

Electronic Timer

K-23 PHOTOSWITCH INCORPORATED, 77 Broadway, Cambridge 42, Mass., has introduced Electronic Timer Series 30 for process control and machine timing. The timer is recommended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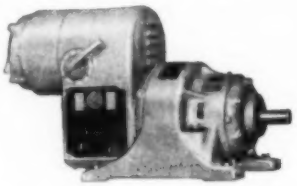
by the manufacturer to control such automatic equipment as drilling machines, automatic filling machines, photographic printers, spot welders, grinders, and honing machines.

Flexibility of the equipment is accomplished by bringing out many points of the circuit through terminals on the front panel. This provides interval, delayed action, automatic repeat, and programming and variations of these four fundamental types of timing. The basic circuit has been designed to be self-compensating for changes in line voltages.

Variable Speed Motor

K-24 U. S. ELECTRICAL MOTORS, INC., 200 E. Slauson Ave., Los Angeles 54, Calif., has developed a new combination geared variable speed motor designed for users of fractional horsepower motors. It combines in one unit a "Va-



ridrive" which permits instant change of speed in a ratio of 1 to 10 and a heavy duty Syncrogear for increasing the torque. It is available in ¼, 1/3, ½ and ¾ hp. Speed ranges are from 10 to 10,000 rpm.

The frame of the unit is cast aluminum. A new type of dial control permits instant speed change by turning the handle less than one revolution to obtain any speed change. The gears of the unit have a hardness of 45/50 Rockwell C. The motor is lower in price than previous types.

◆

Single-Phase Motor

K-25 GENERAL ELECTRIC CO., Schenectay 5, N. Y., has announced a new repulsion-induction motor for use where a constant speed, high torque, single-phase motor is required in large ratings.

Designated as Type SCR, the motor is available in 5, 7½, and 10 hp ratings, all 1800 rpm. The 5 hp unit operates on 115/230 volts, while the other two use 230 volts. The motor is of the open (dripproof type).

Typical applications include air and refrigeration compressors, pumps, stokers, floor surfacers, and other industrial uses.

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TECHNICAL BOOKS

Steam Turbines and Their Cycles

By J. Kenneth Salisbury
Published by John Wiley & Sons, Inc., 440 - 4th Ave., New York, N. Y.
6 x 9 inches—645 pages.
Price, $9.00.

Steam Turbines and Their Cycles presents the essentials of design of steam turbines from basic to advanced information. Necessary thermodynamics, cycle theory, and flow of fluids background is presented early in the book with practical short-cut data of value in daily design work. Data on steam, theoretical heat rates, and steam charts are included in the Appendix for ready reference. Illustrations and practical problems at the end of each chapter facilitate lasting comprehension of the subject matter.

The volume includes discussion of a cycle evaluation method which permits the simple and accurate calculation of losses in the feedwater-heating cycle. This method also facilitates direct correction from test of guarantee cycle, economic appraisal of proposed design changes in a given cycle, and a perspective of losses in feedwater-heating systems.

The book is prepared for users and manufacturers of steam turbines, designers of power plant cycles and turbines, and test engineers in power plants.

◆

Hydroelectric Handbook

By William P. Creager and Joel D. Justin.
Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y.
6 x 9 inches—1151 pages.
Price, 12.50.

This second edition is a complete revision of the original 1927 version which has been out of print for several years. The new edition is compiled to provide engineers with current and practical data on the design and construction of all types of hydroelectric plants, dams, and irrigation projects. Topics covered include power costs, hydraulics, estimating stream flow, powerhouses, conduits, turbines, and generator installation. The most recent advances in the field of hydroelectric engineering are covered.

◆

Sales Engineering

By Bernard Lester
Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y.
6 x 9 inches—226 pages.
Price, $3.00.

This second edition, prepared by an experienced sales engineer, is concerned with "the art of selling equipment and services that require engineering skill in their selection, application, and use". The book describes the type of work this involves, the opportunities it offers for a career, and the methods—skills and techniques—that the author has found successful in many years of selling machinery, equipment, and technical products to industry. The second edition has been enlarged to include suggestions made by users of the book.

◆

Steam and Gas Turbines

By Bernhardt G. A. Skrotzki and William A. Vopat.
Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y.
6 x 9 inches—395 pages.
Price, $5.00.

"Steam and Gas Turbines" is prepared for operating engineers, maintenance men, and others in the power field to use as an aid in the efficient operation of turbines. It describes the general arrangement and assembly of steam and gas turbines—the operating principles involved—their performance limitations — and the auxiliary and control devices needed for operation.

Short-cut methods for estimating expected peformances of new turbines are outlined, as are methods for checking the performance of existing units against original guarantees or tests. The book includes the latest design of reheat steam turbines,, automatic-extraction turbines, small-output gas turbines, regenerative-cycle units, and power-gas generators or free-piston compressors. Oiling systems of all turbine types—from the small auxiliary-drive to prime-mover—are covered.

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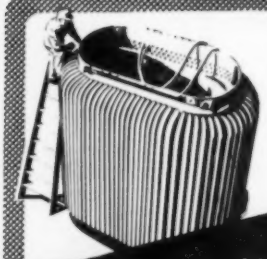

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B-11 **PNEUMATIC TOOLS**—Catalog 47, 24 pages—Describes Cleco pneumatic tools for industry—heavy grinders, sanders, buffers, rotary file and burr machines, drills, reamers, screwdrivers, impart wrenches, etc.—CLECO DIVISION, REED ROLLER BIT COMPANY, Box 2119, Houston, Texas.

B-12 **PIPE FITTINGS**—Catalog 50F, 118 pages—Describes cast iron and malleable pipe fittings for every pipe line. Designed for conciseness and easy reference. Complete listings on each page. Photograph and dimension drawing of each fitting. Prices, weight, and dimensions are listed.—STOCKHAM VALVES AND FITTINGS, Box 2592, Birmingham 2, Ala.

B-13 **STEEL VALVES**—Folder, 6 pages—Describes and illustrates new line of small size, high pressure, cast steel valves for such services as high pressure steam, boiler feedwater, by-pass, instrument and throttling. Small size pressure seal angle and Y check valves included.—THE WM. POWELL COMPANY, P. O. Box 106, Station B, Cincinnati 22, Ohio.

B-14 **STEEL CURTAIN WALLS**—Booklet A.I.A. File No. 15-H-1, 24 pages—Contains progress report on stainless steel curtain wall construction. Gives specific examples of developments and is illustrated with scale drawings. Discusses building codes and tests affecting stainless steel curtain wall construction. — ALLEGHENY LUDLUM STEEL CORP., 2020 Oliver Bldg., Pittsburgh 22, Pa.

B-15 **CENTRIFUGAL PUMPS** — Bulletin W-306-B1—Describes Monobloc centrifugal pumps, single and two stage, sizes 1 to 5, designed for small boiler feed, cooling service and condensate service, and circulation systems. Includes specifications, motor data, and materials for construction.—WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J.

B-16 **UNIONS AND PARTS**—Catalog 50, 28 pages—Blocks, anchor gas burners, thread compounds, valve handles, lubricators, fusible boiler plugs, steam gauge protectors, warehouse and derrick stoves, unions and parts are catalogued and illustrated. Price list included.—WELL EQUIPMENT MFG. CORP., 2023 Semmes St., Houston, Texas.

B-17 **LEATHER BELT DRIVE**—Bulletin, 4 pages—Illustrates and describes the Uni-Pull Drive. Explains construction, operation, and applications. Diagrams show adaptability with different types of machines, with motor located on, below, or above the machine.—AMERICAN LEATHER BELTING ASSOCIATION, 41 Park Row, New York, N. Y.

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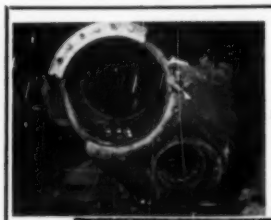

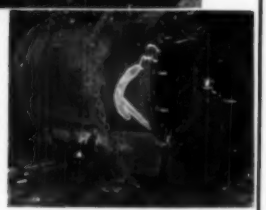

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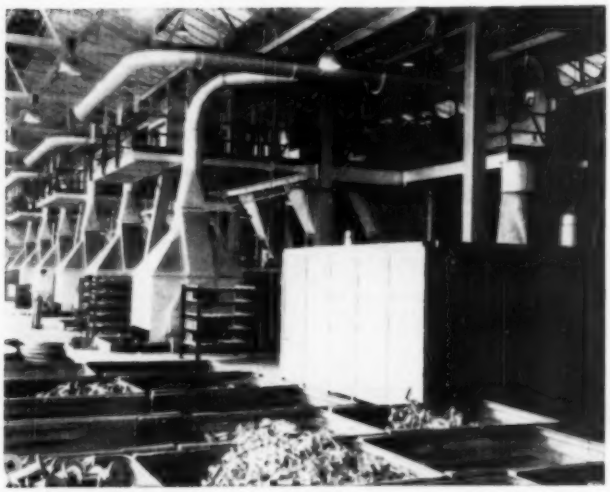

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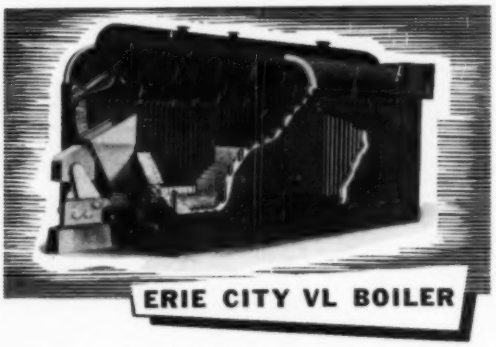

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B-20 WELDING SUPPLIES—Bulletin 467, 8 pages—Catalogs Lincoln electrode holders, protective shields, welding cable, and includes list of books on arc welding, with descriptive data and prices. Includes information on Lincoln welding school, and list of films available for instruction.—THE LINCOLN ELECTRIC COMPANY, Cleveland 1, Ohio.

B-21 STEAMERS—Booklet, 8 pages—Self-contained, completely automatic units for packaged portable steam supplies are described iwth recommended services and applicational photographs. Diagram shows piping arrangement.—BETTIS CORPORATION, 1507 Maury St., Houston, Texas.

B-22 HOSE COUPLINGS AND FITTINGS—Catalog Section 3100, 12 pages—Pictures and gives details on each type coupling and fitting in the B. F. Goodrich line, with specifications, general and maximum pressure recommendations, and a description of threads.—THE B. F. GOODRICH COMPANY, Akron, Ohio.

B-23 ROTARY PUMPS—Bulletin L313A-B, 8 pages—Describes the new De Laval rotary pump, with photographs and diagrams to explain design, construction, operation, and applications. Tables give performance data and dimensions.—De LAVAL STEAM TURBINE COMPANY, Trenton 2, N. J.

B-24 D-C MOTORS—Bulletin C-2001, 12 pages—Contains design, construction, selection, and ordering information, with frame dimensions, for heavy duty, constant and adjustable speed motors. Mechanical features and electrical characteristics are covered.—RELIANCE ELECTRIC AND ENGINEERING CO., 1088 Ivanhoe Road, Cleveland 10, Ohio.

B-25 STEAM TURBINES—Bulletin S-146, 12 pages—"The Terry Multistage Turbine" gives data on casing, lagging, blades, nozzles, wheels, shafts, bearings, interstage and end glands, governors, synchronizers, governor valves, steam strainers, nozzle control valves, sliding feet, auxiliary oil pumps, and lubrication.—TERRY STEAM TURBINE COMPANY, Hartford, Conn.

B-26 CORROSION PREVENTION—Bulletin 93, 4 pages—Briefly describes the Metco Systems and their uses and applications for corrosion prevention on tanks, piling, refrigeration equipment, and fabricated steel products.—METALLIZING ENGINEERING CO., INC., 38-14 30th St., Long Island City 1, N. Y.

B-27 HYDRAULIC TURBINES—Bulletin 02R7301, 56 pages—Describes design and construction of Francis, propeller and impulse type, hydraulic turbines and such auxiliaries as pressure regulators, special high head valves, butterfly valves, and cabinet type governors for large units. Gives specific case histories. Fully illustrated.—ALLIS-CHALMERS MFG. CO., 954 S. 70th St., Milwaukee, Wis.

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B-30 HEAVY DUTY EQUIPMENT—Maintenance Catalog 550, 34 pages—Itemizes babbitted journal boxes, roller bearing pillow blocks, centrifugal slurry pumps, water valves, conveyor takeups, roller holdbacks, and perforated steel screen plates. Includes specifications on conveyor and drive pulleys, V-belt sheaves, gears, sprockets, shafts, and keys.—McNALLY PITTSBURG MFG. CORP., Pittsburg, Kans.

B-31 STUD WELDING—Booklet, 16 pages—Reprint of chapter on "Stud Welding" from third edition of Welding Handbook, published by American Welding Society. Explains stud welding method of fastening, describes the equipment and its principal uses, and gives stud locating procedures and other data.—NELSON STUD WELDING DIVISION of MORTON GREGORY CORPORATION, Lorain, Ohio.

B-32 LAMINATED PANELS—Booklet, A. I. A. File No. 17-A, 12 pages—Describes new laminated panel designed to provide permanent curtain walls or interior partitions. Contains installational pictures, construction details, and technical data.—KAYLO DIVISION, OWENS-ILLINOIS GLASS COMPANY, Toledo 1, Ohio.

B-33 WATER TREATMENT—Booklet, 4 pages—Describes the company's industrial water engineering services in the fields of water procurement, treatment, usage and disposal. Typical service problems are discussed, with illustrations showing flow schemes of water in process and disposal.—HALL LABORATORIES, INC., Hagan Bldg., Pittsburgh 30, Pa.

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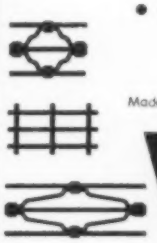

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1—National Pressure Pump, Size 50, Model F, 50 lbs. pressure per square inch 520 RPM, 3" suction, 2½" discharge, complete with GE gear motor model 3B2257144, 3 HP, 230 volt DC, 1750/513.1 RPM, ratio 3.41 to 1, shunt wound, ball bearing, semi-enclosed.

6—Ingersoll Rand Coolant Pumps direct connected to General Electric 1/6 HP, 3 phase, 60 cycle, 1140 RPM, Type 903.

1—Jacuzzi Bros. Pump with float and float rod complete with General Electric motor, Model 5KH45AB1539AX, ¾ HP, 1800 RPM, 115 volt, 60 cycle, single phase.

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1—Worthington Monobloc Centrifugal Pump, Model 4DE5, SN No. 1207194, complete with motor, Type PA, Frame 364—20 HP, 1800 RPM, 220/440 volt. Rating of pump: Minimum 300 GPM at 110' head to maximum 1000 GPM at 60' head.

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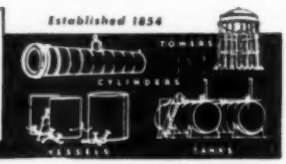

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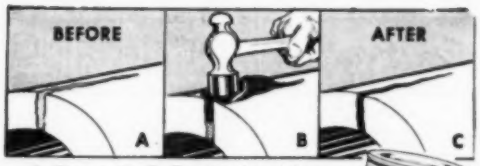

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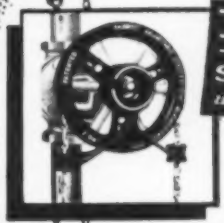

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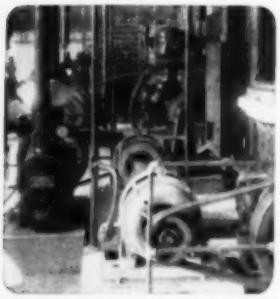

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for Every Application

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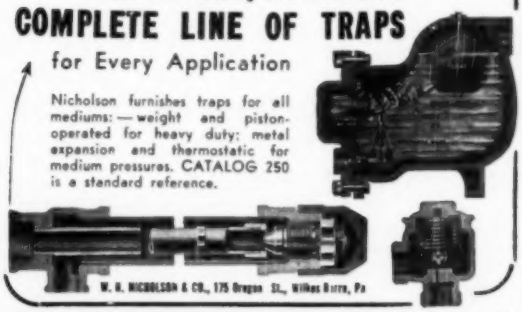

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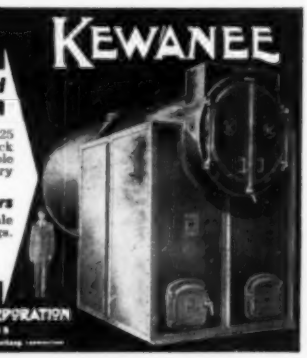

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KEWANEE, ILLINOIS

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For example, Waldron Couplings are made with

One-Piece Cover Sleeve

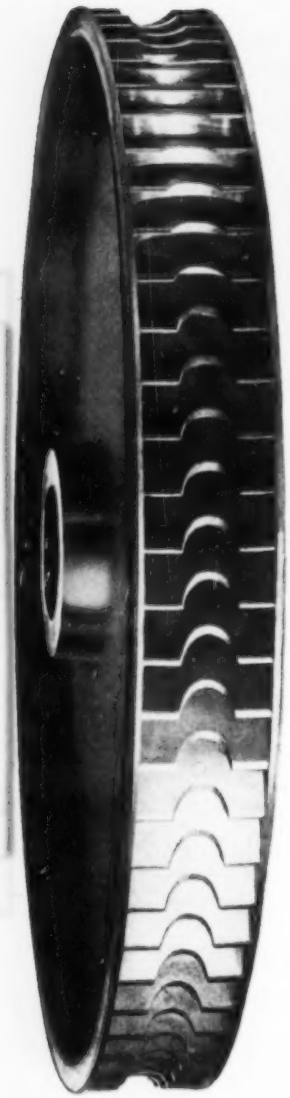
No Welded Sections here

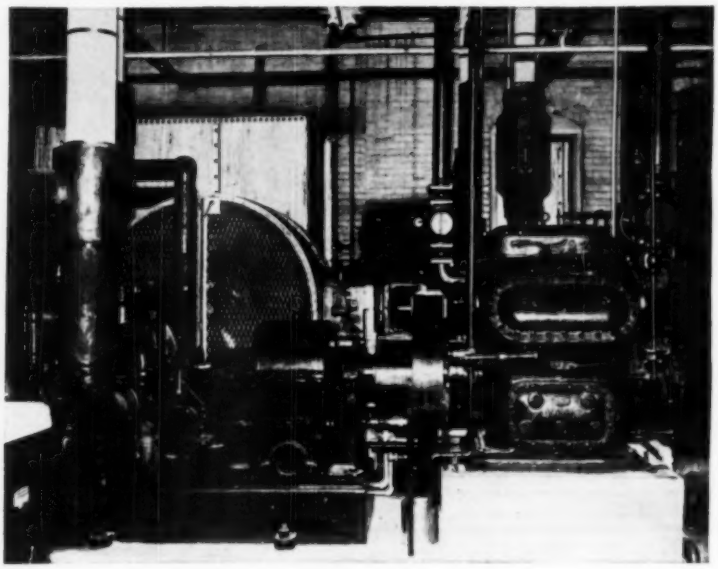
The Waldron cover sleeve is one solid forged steel piece with no welding to distort the accurate gear inside. This feature not only prevents possible trouble but also permits operation at highest speeds.

For details on other construction and operating advantages — ratings, service factors, etc. — ask for Catalog 57.

JOHN WALDRON CORP.
Main Office and Works
New Brunswick, New Jersey
COUPLINGS
Sales Representatives in Principal Cities

the Terry Turbine





Refrigeration Compressor Driven By Terry Turbine

AT HAMPDEN BREWERY

This 150 hp Terry Turbine — at the Willimansett, Mass. plant of the Hampden Brewing Co. — operates at 3800 rpm with a gear reducing it to 720 rpm. It is coupled to a 6 cylinder reciprocating compressor.

The installation is running on steam conditions of 120 psi — 0° superheat, and the steam to the turbine is automatically throttled to maintain a constant 30 psi back pressure for process and heating. The installation was developed by Fred Ophuls & Associates Consulting Engineers.

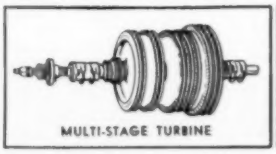
Get more information on the wide range line of Terry Turbines from your local District Representative. There's no obligation for a complete discussion of your specific requirements. Also send for Bulletin S-143 that gives full details.

THE TERRY STEAM TURBINE CO.

TERRY SQUARE, HARTFORD 1, CONN.

TT-1186

Terry



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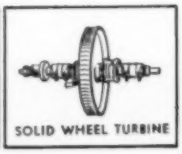
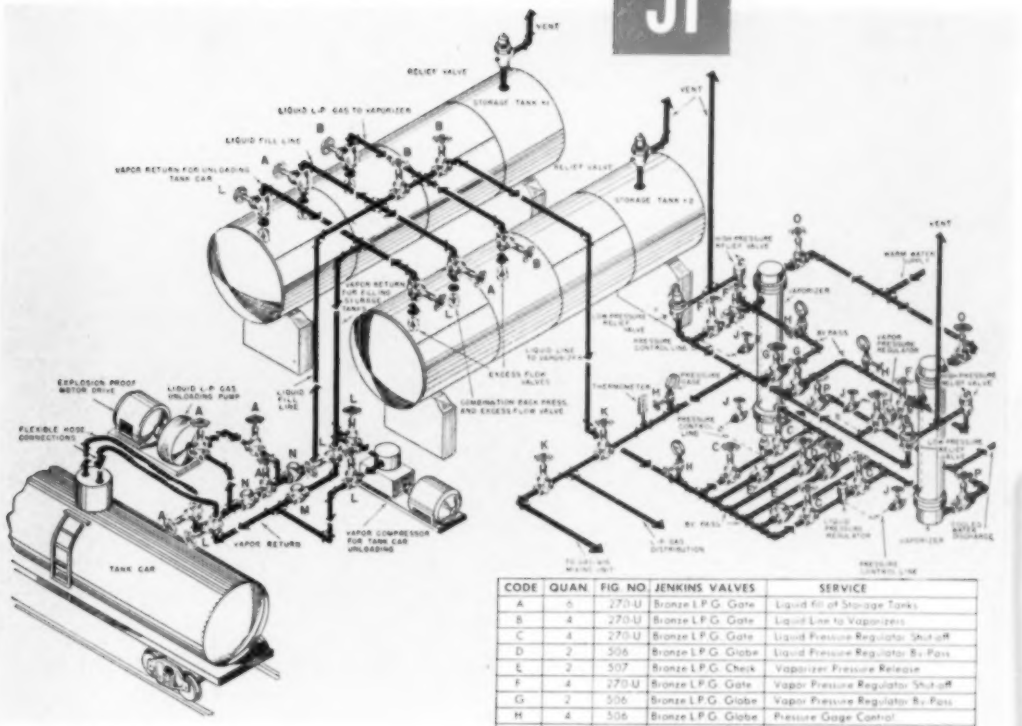


SOLID WHEEL TURBINE

JENKINS PRACTICAL PIPING LAYOUTS **51**



CODE	QUAN	FIG. NO.	JENKINS VALVES	SERVICE
A	6	270-U	Bronze L.P.G. Gate	Liquid fill of Storage Tanks
B	4	270-U	Bronze L.P.G. Gate	Liquid Line to Vaporizers
C	4	270-U	Bronze L.P.G. Gate	Liquid Pressure Regulator Shut-off
D	2	506	Bronze L.P.G. Globe	Liquid Pressure Regulator By-Pass
E	2	507	Bronze L.P.G. Check	Vaporizer Pressure Release
F	4	270-U	Bronze L.P.G. Gate	Vapor Pressure Regulator Shut-off
G	2	506	Bronze L.P.G. Globe	Vapor Pressure Regulator By-Pass
H	4	506	Bronze L.P.G. Globe	Pressure Gage Control
J	4	506	Bronze L.P.G. Globe	Pressure Control Line Shut-off
K	2	270-U	Bronze L.P.G. Gate	Distribution System Shut-off
L	6	270-U	Bronze L.P.G. Gate	Vapor Return for Tank Car
M	1	507	Bronze L.P.G. Check	Prevent Vapor Backflow
N	2	507	Bronze L.P.G. Check	Prevent Liquid Backflow
O	2	47	Bronze Gate	Warm Water Supply
P	2	106-A	Bronze Globe	Cool Water Discharge

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THIS GASEOUS FUEL is then piped through a pressure regulator which assures a constant pressure, and on to the gas distribution system or gas-air mix unit. Duplicate vaporizers provide continuous service in case of breakdown. Safety relief valves are vented to the atmosphere. Check valve on vaporizer inlet acts as a relief valve when vaporizer pressure exceeds that of tank.

Consultation with accredited piping engineers and contractors is recommended when planning major piping installations.

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To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering, select all the valves you need from the Jenkins Catalog. It's your best assurance of *lowest cost in the long run.*

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CHEMISTRY APPLIED TO MAINTENANCE CLEANING PROBLEMS

Dowell Service saved $87.92 in steam per day!

Dowell Service was used by a major steel company to clean a large turbo blower condenser. After the cleaning, operating figures showed a saving in steam of 8000 lb. per hour or a dollar saving of $87.92 per day. At this rate, *Dowell Service paid for itself in 5½ days!*

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Do you have a cleaning problem, too . . . a place where deposits are causing a maintenance headache? Call Dowell. Skilled cleaning engineers are available for consultation at no obligation.

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